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AMERICAN HEALTH PRIMERS.

THE

THROAT AND THE VOICE.

BY

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Lecturer on Diseases of the Throat and Chest in Jefferson Medical College, and on Physiology and Hygiene of Voice in the National School of Elocution and Oratory.

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PREFACE.

THERE is no pretension, in the following pages, to teach either the art of practising medicine or the art of cultivating the voice. The aim of the writer has been to direct the attention of the general reader to some scientific facts concerning THE THROAT AND THE VOICE, and to present for consideration some opinions and advice based upon an intelligent appreciation of those facts.

Should the perusal of this little volume incite desire for fuller expositions than have been displayed in the "Primer," ample material is accessible in various treatises on Anatomy, Physiology, Physics, and Vocal Culture. Study from these sources will be the more profitable, the more it is supplemented by personal investigation.

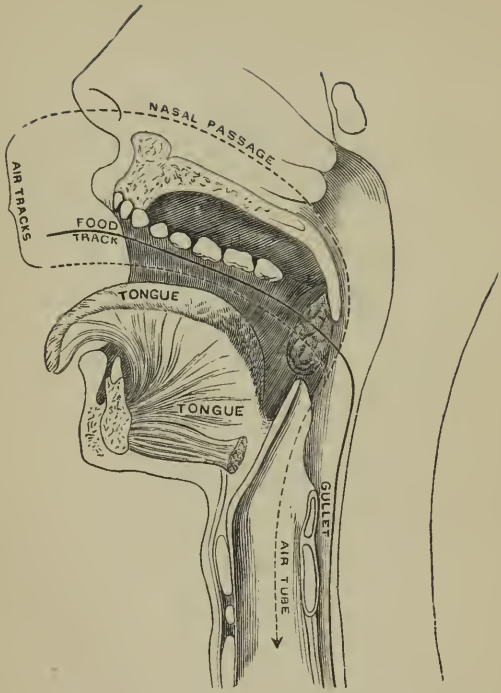


Fig. I. — Diagrammatic Anatomical Sketch of the Throat and Adjoining Structures, in Vertical Section; to Indicate the Course of the Air and Food Tracks.

THE THROAT AND THE VOICE.

PART I.

THE THROAT.

CHAPTER I.

GENERAL CONSTRUCTION OF THE THROAT.

THE throat is the common highway, so to speak, for the passage of air to the lungs and of food to the stomach.

It is protected and enclosed by various muscular and bony structures, chiefly occupying the neck, along which, too, course the great blood-vessels that nourish the head and the brain, as well as the great nerve-trunks that pass from the brain to the lungs, heart, stomach and intestines, and other organs; while the strong bones at the back of the neck enclose the most important, or most vital, part of the spinal cord.

Thus the throat and neck, together, are very important regions of the body. The neck is directly

exposed to atmospheric changes of wind and moisture, which sometimes induce disease in the throat or in the lungs; and the interior of the throat is exposed, in addition, to the baneful influences of whatever deleterious substances may happen to be floating in the atmosphere.

Fig. I. (see Frontispiece) is a diagramatic, anatomical sketch, showing *the double route taken by the air through the nose and the mouth to the air-tube*, as designated by the dotted lines, and *the single route taken by the food through the mouth into the gullet behind the air-tube*, indicated by the unbroken line.

Keeping the relations of the food- and air-tracts in mind, let the reader look into the throat of an individual whose tongue is kept flat down on the floor of the mouth by a paper-cutter, spoon-handle, or something of that kind. This will expose to view the interior of that portion of the throat (the middle portion of the *pharynx*) which is common to the two great avenues by which air and food are conveyed into the interior of the body. The avenue for air, or the *respiratory tract*, is a double one at top, air reaching the pharynx by the interior of the nose above, as in ordinary breathing, or by the mouth in front, as in occasional breathing. Passing through the pharynx, the air next passes through a rigid tube (*larynx* and *trachea*), the windpipe, open on top,—except at moments of swallowing and during certain accidents,—

and always distended by means of stiff plates and rings of gristle (*cartilage*), which surround it more or less completely. Thence, the air passes along the subdividing continuations of the air-tube or windpipe (*primitive*, *diminutive*, and *terminative* or *ultimate bronchial* tubes) until it reaches the air-cells of the lungs, which are grouped in series around each ultimate extremity of this series of air-passages. These successive divisions of the air-tube are, progressively, smaller and smaller, the terminal ones being about one-fortieth of an inch in diameter.

The avenue for food, or the *alimentary tract*, passes through the mouth into the pharynx, which it follows down directly into the gullet (food-pipe, *œsophagus*), continuous with the pharynx, and leading into the stomach. This gullet is located behind the upper part of the air-tube (larynx and trachea), and rests against the spinal column, or back-bone. The gullet, however, is a flaccid tube, its anterior and posterior walls being in contact, except when separated by the entrance of morsels of food or swallows of liquid.

Now, although air may enter the body by two avenues — nose and mouth,— it is to be remembered that respiration through the nose is the natural method. Consequently, whenever respiration takes place habitually through the mouth, that method of breathing is indicative of some obstruction in the nasal passages

or in the upper portion of the pharynx, temporary or permanent, as may be.

If the reader will examine the image of his mouth and throat as reflected in a well-illuminated mirror, such as a hand-mirror, which he can move in such a manner as to throw the rays of light upon the various portions he is observing, he will notice a movable curtain, *the soft palate*, hanging from the back portion of the roof of the mouth, or *hard palate*. When a deep inspiration is taken through the mouth, it will be noticed that this soft palate is forced backward until it touches the back wall of the throat, *the pharynx;* but when the inspiration is taken through the nose, it will be seen that the soft palate moves forward somewhat, so as to leave a considerable space between it and the pharynx, in order that the air can pass by that route into the larynx, and thence through the windpipe into the lungs. This soft palate is composed chiefly of muscles, covered by the general lining membrane (mucous membrane) of the mouth and throat. Its lower border is crescentic on each side, the central portion being prolonged into a tapering extremity, the *uvula*, which, when elongated, is apt to touch the base of the tongue or the valve (*epiglottis*) on top of the larynx, and thus produce a sense of tickling, or other annoyance, which gives frequent rise to "hemming" or to a slight cough to relieve the disagreeable sensation. The soft palate on each side of the

uvula is seen to divide into two folds, the front and narrower one of which reaches downward to the side of the root of the tongue, while the back and broader one reaches farther down to the side of the throat or pharynx. Between each of these pair of folds, a small body, *the tonsil*, is seen to project slightly. Each tonsil is a mass of glands, very apt to become enlarged in acute and chronic sore throat. Acute inflammation of the tonsil constitutes the prominent feature of the affection known as *quinsy*. The tonsils are apt to become permanently enlarged in scrofulous people, and then sometimes interfere so much with respiration as to require removal of a considerable portion of their bulk. They rarely enlarge for the first time after about the thirtieth year of age. Children with chronically enlarged tonsils are liable to a deformity of the chest, on account of the position they are compelled to assume in order to breathe with any degree of comfort. This likewise interferes with due expansion of the lungs, and proper aeration of the blood; thus often leading to serious ill-health. It is therefore of the greatest importance to future well-being that diseased tonsils be properly treated,—the sooner the better. Confidence in the popular opinion that children "will grow out of it" will only end in prolonged suffering, to be finally terminated by the interference which should have been instituted long before.

The back portion of the throat is the posterior wall of the pharynx, and is continuous with the back wall of the gullet or food-pipe, the *œsophagus*. Like the palate, it is chiefly muscular in structure, and is covered by a continuation of the same lining or *mucous* membrane. It is loosely attached to the spinal column and can be moved upon it. In diseases of the bones of the spinal column in this location, and in diseases of the glands between the gullet and the spinal column, this posterior wall of the throat is apt to become pushed forward into the free space of the throat by an abscess, or collection of pus, which interferes with respiration and with swallowing. As this disease occurs most frequently in children, the condition is often confounded with croup.

The pharynx continues upward along the spinal column behind the palate until it reaches the base of the skull, when it bends forward into a vaulted roof, which has much the shape of the crooked forefinger, or the top of a buggy wagon or phaeton. It is often easy to pass the finger up behind the palate of an individual and feel this roof of the pharynx. Being quite near the nerves from the brain, diseases of this portion of the pharynx are apt to be attended with a peculiar form of headache located just behind the upper portion of the root of the nose. If the forefinger carried up behind the palate is directed forward, a sharp ridge will be felt in front at the

middle line. This is the hindermost portion of the septum or partition of the nose. On each side of it is an opening, which is the posterior orifice or outlet of the nasal passage. To each side of these openings, on the side wall of the pharynx, is a small protuberance, in the centre of which is a depression which leads into a delicate tube reaching to the drum portion of the ear, being in fact the vent-hole of that drum. When the nose is blown during the existence of a cold in the head, a crackling is heard in the ear, due to the driving of air through a collection of mucus which has accumulated at the mouth of this tube. Diseases of the back portion of the nose and of the sides of the pharynx are very apt to be continued into the ears in this way; and that is the reason why so many diseases of the ear follow the sore throat of scarlet-fever, chronic sore throat, chronic catarrh of the nasal passages, and so on. Some of the muscles of the palate cover a portion of the walls of the orifice of this tube, and this accounts for pain in the ears felt in many diseases of the throat, especially during the act of swallowing, which draws on the orifice of the tube to open it and let air penetrate into the drum of the ear.

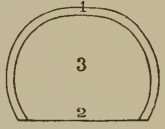
If the tongue is pulled forcibly forward, a little curved projection is sometimes seen behind it, at its deepest portion. This, *the epiglottis*, is a valve of gristle, by which the air-passage is covered over, dur-

ing the movement of swallowing, to prevent the food or drink from going the wrong way, *i. e.* into the larynx instead of the gullet. [See *Larynx* and *Epiglottis*, article *Voice.*] It participates with the movements of the tongue, to the root of which it is attached by a strong ligament. It is also attached by ligaments to the sides of the throat; and when these ligaments are very tense, their edges present to the finger the sensation of a thin and firm foreign body, such as a pin or fish-bone, and are even liable to be mistaken for the intruder in cases in which such foreign bodies have been swallowed, and be thus ruthlessly pulled upon by those who are not aware of this circumstance.

The larynx, which is guarded by this trap-door-like epiglottis, and which will be described in the article on Voice, to which it more appropriately belongs in this volume, is the vestibule or entrance into the windpipe (*trachea*). The windpipe is a hemispherical or tunnel-shaped tube running down the front part of the neck, dipping behind the breastbone into the chest, where it divides and subdivides into the bronchial tubes. As respiration must be continuous, it is essential that this tube should always be open; and it is therefore strengthened by a series of hoops of cartilage in its front or hemispherical portion, while its posterior or flat portion is membranous and flexible, so as to yield to the pressure of articles of food or

drink which pass down the gullet or food-pipe, which is just behind it. Most popular accounts of this tube convey an impression that it is circular rather than more or less hemispherical, as here described and figured. The membranous portion is smaller in the female than in the male.

Fig. II.—Diagram of a Transverse Section through the Main Windpipe, or Trachea, of a Male Subject.



1. Cartilage of the windpipe. 2. Membranous posterior wall of the windpipe. 3. Free space or cavity of the windpipe.

All the structures of the throat are lined, or covered, rather, with mucous membrane containing numerous little glands which secrete a bland, lubricating fluid which keeps the parts moist, pliable, and comfortable. When this fluid is deficient, the parts become dry and uncomfortable; and when it is in excess, it becomes mingled with little cast-off scales, similar to those shed off by the skin, as observed in the water after a bath, forming thick, tenacious masses of mucus, which irritate the parts and give rise to cough to get rid of them. The mucous membrane of the nasal passages and of the windpipe is provided with minute brush or hair-like processes, visible only under the microscope, which are continually waving towards the exterior of the body, and thus assist in brushing out any excess of mucus or particles of dust

which have been inhaled into the nose or windpipe. In certain affections, these little hair-like appendages (*cilia*) are destroyed, without being reproduced, as they are in the healthy state ; and then there is some difficulty in getting rid naturally of the products alluded to in the last sentence, giving rise to more or less painful voluntary efforts of hawking, hemming, and coughing to eject them. Besides this, the delicate mucous membrane is exposed to the irritation of the air, and thus becomes further and further diseased, sometimes leading to the formation of real sores or ulcers. It is quite likely that many severe sore throats would be prevented, if the little annoyances which the loss of the cilia occasion were promptly remedied by application to the physician instead of the more frequent resort to the various cough mixtures, expectorants, and lozenges exposed for sale. Many of these preparations are absolutely injurious, while there is only one chance out of very many that the article resorted to will happen to suit the individual case to which it is applied, even when the remedy is a good one.

CHAPTER II.

CARE OF THE THROAT.

THERE are few individuals who pass their lives without having been at some time affected with more or less sore throat. In variable climates sore throat is much more frequent than in equable climates. It is much more frequent, also, in localities where individuals are exposed to the irritating influences of particles of dust and other materials in the atmosphere, and which are inhaled in respiration. Consequently, people working in factories, chemical laboratories, and the like, are quite subject to sore throat independently of any special proclivity thereto; while they are still more likely to suffer if constitutionally subject to sore throat. Such individuals are recommended to wear little respirators in front of the nose and the mouth during exposure, in order to filter the respired air, as it were, and catch these minute particles in their passage towards the throat. There is a variety of respirators for use, under these circumstances, some of which are so arranged as to contain masses of raw cotton or wool, which collect the dust

and dirt, and which can be removed from time to time as they become foul. One of these, represented in Fig. III., is composed of meshes of delicate silvered wire, covered in front with a piece of silk. Pliny mentions that workers in mines were accustomed to fasten bladders before their mouths; and that the Roman bakers placed cloths in front of their faces when working in atmospheres loaded with dust.

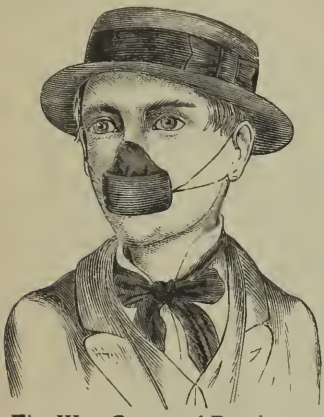


Fig. III.—Oro-nasal Respirator.

It is often found, too, that individuals suffering from consumption, chronic bronchitis, or even only with undue delicacy of the mucous membrane of the throat, are unable to face the air in windy and inclement weather. Sometimes they are unable to withstand the changes of temperature even on days which promise to be pleasant. Under such circumstances, they are compelled to keep in the house, or to muffle the mouth and nose with a handkerchief, veil, or something of that kind when they go out into the open air. The temperature of the inspired air is modified by the warmth imparted to the comforter

by the hotter air of respiration, while, at the same time, its pungency is moderated, if too rich in oxygen for the sensitive throat or air-passages. Unmitigated sunlight is known to be often irritating to sore eyes; and in like manner unmitigated atmospheric air is sometimes too irritant to sore throats, sore air-passages, and sore lungs. In Great Britain, a respirator of a series of fine metallic meshes, covered with silk, is much used, and, if duly appreciated, would be much used in this country also. Some respirators are made merely to cover the mouth, so as to encourage nasal or normal respiration; and others (Fig. III., p. 20) to cover both mouth and nose. These appliances are rather unsightly, to be sure, but their use often enables invalids to take regular out-door exercise, in carriage or on foot, instead of undergoing compulsory confinement to the house for fear of catching cold. Ladies may make use of a respiratory veil (Fig. IV.), devised by Mr. Lennox Browne, of London. It consists of a piece of plain, unspotted blonde, with a double

Fig. IV.
The Respiratory Veil.

thickness of silk gossamer on the lower four inches. The part that covers the mouth and nostrils is stiffened by a layer of thin wire gauze, so that the veil may stand a little away from the mouth and be more comfortable. Such a veil is easily made at home.

There is a special proclivity to sore throat in many persons. This is often hereditary. People so disposed require more precaution than others in exposing themselves to the changes of the atmosphere, and to other causes which are likely to excite sore throat.

The most frequent exciting cause of diseases of the throat appears to be the direct action of cold upon the heated body, especially during active perspiration. Sudden exposure to heat when the body has been chilled, is likewise a frequent cause of sore throat. It is therefore necessary to avoid these sudden exposures. In cold weather, for instance, when the temperature in-doors is much higher than it is out of doors, one should not go into the open air directly from a warm room, or go at once into a very warm room, and still less, close to a fire, on coming into the house from the street. A few minutes should be passed in the entry, in either instance, so as to render the change more gradual. In similar manner, a cool bath should not be taken while the body is in active perspiration, lest it check the natural transudation of fluids and throw them in, as it is termed, upon the

internal organs, to their detriment. Taking a child from a warm bed to the window to see a parade, etc., is a not infrequent cause of the severest kind of sore throat.

Another frequent source of sore throat, to which males are subjected much more than females, is breathing in an atmosphere laden with tobacco smoke, as in the sitting-rooms of public houses, certain concert-saloons, and the like. This is a much more frequent source of danger than smoking tobacco in a private apartment, although that, too, is sometimes a cause of sore throat. If a smoker is subject to attacks of sore throat, and is too wedded to his weed to divorce himself from it, he should smoke a long-stemmed pipe in preference to any other contrivance, because it renders the smoke cooler by the time it reaches the throat. The next safest thing to smoke is a long cigar, not much more than half of which should be used, because the remainder becomes warmer and more loaded with the poisonous products of the combustion. A short pipe is not as safe as a cigar, and a cigarette is the most injurious of all. The habits of inhaling the tobacco smoke, of swallowing it, or of passing it out by the nose, are all likely to lead to disease of the parts over which the smoke is forced. Indeed, there is a peculiar condition of the throat produced by tobacco smoking, which almost any slave to the practice can observe in

himself. It consists in a series of opalescent or milky-looking patches at the inside of the corners of the mouth and lips, and some other localities, due to a sort of raising of the outermost layer of the mucous membrane. These spots are known as *the milky patches of smokers*, and are sometimes mistaken for evidence of a very unfortunate constitutional form of sore throat. They subside, usually, on abandoning the practice.

Another source of sore throat, very common in the United States, is the use of ice-water at meals. Many persons take their coffee, tea, soups, meats, and vegetables very hot, and cool the parts — mouth and throat — by draughts of ice-water immediately afterward. This frequent alternation of extreme heat and cold eventually injures the delicate structures subjected to it. Even when ice-water is used at proper times, it is best to take it by sips, which should be allowed to remain a few moments in the mouth until the extreme chill has passed off, than to pour it down the throat in a series of continuous swallows.

Another source of sore throat exists in overstraining the muscles in loud talking, protracted reading aloud and singing, screaming, calling to the deaf, and so on. In public speakers and singers, sore throat is often due to improper methods of breathing and of using the voice, and is only to be corrected by judicious elocutionary exercise, or a system of vocal gymnas-

tics. Theatrical performers, on the other hand, who pay much greater attention to a proper use of their vocal organs, rarely suffer from this cause, although they are subject to sore throat from ill-ventilated dressing-rooms, exposed and illy heated stage-flies, and the like.

Finally, the inordinate use of alcoholic liquors is another source of sore throat.

Individuals predisposed to contract sore throat, or specially liable to exposure to the causes that produce it, should get into the habit of bathing the surface of the body every morning on leaving the bed. Those who prefer the regular bath by immersion may resort to that. Some prefer the shower-bath. When the full bath is inconvenient, the body should be mopped with a wet sponge or towel, the temperature of the water being as cool as is consistent with a feeling of comfort. If the practice is begun during warm weather, with the ordinary water in the wash-basin, it can be continued on into the winter, and throughout the winter, too, for that matter, by most persons, without any necessity for heating the water as the weather becomes colder. If the practice is commenced during the cold weather, the water may be used warm at first, and gradually be used less and less warm as the individual becomes accustomed to it. If the cold bath or cold bathing chills the surface at any period of the year, summer or winter, or does not

produce an agreeable glowing sensation after it, the water used may be impregnated with a little table salt, pickling salt, or sea salt, in the proportion of a handful to a bucket of water. A bag of salt may be immersed in the water a short time before it is used. Where even this plan fails in its purpose, a cloth or sponge dipped in warm water, warm salt water, or warm acidulated water, (say a teaspoonful of aromatic sulphuric acid or a teaspoonful or two of vinegar to the ordinary basinful,) may be applied to small portions of the body exposed in succession, until the system becomes educated, as it were, to endure simple water at ordinary temperatures. There is no necessity for the use of a flesh-brush or rough towel after these ablutions, though there is no objection to be made to their use when their effects are agreeable. These baths are excellent tonics to the skin, and, through the influence of the nerves ramifying in it, to the system at large. They induce increased tolerance to ordinary atmospheric changes, and often inure the constitution to resist injurious influences which might otherwise be sustained by forced or unexpected exposure to extraordinary changes.

A person subject to diseases of the throat should be exceedingly careful as regards the use of underclothing. The undershirt and drawers should be of flannel, or of some mixed fabric containing wool, such as the ordinary merino garments of the shops. Those

who can afford it may use silk. Silk and wool, being animal fabrics, are much more suitable for covering the human animal than vegetable fabrics, such as cotton and linen. Buckskin and chamois, though animal fabrics, are not suitable for underclothing, no matter how well "perforated" they may be to provide better ventilation. They are very soon rendered very filthy garments, even on the cleanliest bodies, because they retain accumulated products of cutaneous secretion, which undergo decomposition, and are often productive of great injury. An undergarment should be of loose texture, and capable of being easily washed or made clean.

To suit the varying seasons of a climate such as ours, three varieties of weight of underclothing should be used,—one, the lightest texture made, for the extreme heat of summer; one of medium texture, for late spring and the autumn, and one much heavier, for winter and early spring. Changes from heavy fabrics to lighter ones should not be made until there is positive evidence of confirmed change of season. Some individuals wear underclothing of very light texture altogether, and use one, two, or more of them, as may be required, in preference to having garments of varying texture. The plan is a good one, especially for those who are apt to make too premature changes. It is very serviceable, too, when a change is made from heavy outer garments to

light ones, as in dressing for an evening entertainment, when the lessened weight in the dress-clothing may be supplemented by an additional light undershirt and a pair of drawers. The underclothing worn in the daytime should be removed on going to bed, and be turned inside out to air and become well dried and ventilated by morning. It is very imprudent to sleep in the same underclothing which has been worn all day, or to wear during the day the underclothing used at night. It is rarely necessary to keep underclothing on in bed, as there is little or no exposure to direct atmospheric change; but where the protection of a cotton night-gown is insufficient, a flannel night-gown may be used, or a special set of underclothing.

In the matter of stockings, there is not so much necessity for the use of wool in preference to cotton, even in winter.

Boots and shoes are very important articles of clothing with regard to the health of individuals subject to sore throat. Two pairs should always be in use at the same period, to be worn on alternate days respectively, inasmuch as a single night's exposure to the air is usually insufficient to free them from moisture; and the practice of having two pairs in wear at a time will be found productive of an economy of about thirty-three per cent., a matter of some moment to many people in hard times. An additional pair,

exceptionally well-soled, should be kept for use in inclement weather. What are called double-soled shoes or boots should be worn in winter, and in wet weather at any season; and quite light soles are perfectly safe in hot and dry weather.

Water-proof shoes, rubbers, furs, and mufflers of all sorts, are not to be recommended for customary use. Rubbers and light water-proof cloaks are advisable on occasions of special exposure, but should be removed as soon as the special occasion has passed. Water-proof garments should have slits under the armpits, and at other protected points, to favor ventilation.

Confirmed invalids who cough on exposure to the outer air, should be careful not to talk during open-air exercise, and should wear a folded veil or a respirator in front of both nose and mouth when exposed to the wind, in order to modify the irritating influence of cold air upon the delicate mucous membrane of the throat. It is the confirmed opinion of the author, that if invalids suffering from diseases of the respiratory organs would make systematic use of respirators, they would be spared a great deal of suffering, and would actually prolong their lives by the practice.

CHAPTER III.

ACUTE SORE THROATS.

THE term acute sore throat is used to designate an inflammatory condition, of comparatively short duration, affecting any portion or portions of the structures of the throat. Physicians apply separate names to inflammations confined to certain regions, but it is not requisite in this volume to allude to them individually. The chief general causes of acute sore throat are those already enumerated (pp. 22 and 23). There is another cause which must be borne in mind, which occurs chiefly in the dwellings of the poor, who are compelled to allow their children to play about the kitchen, and are unable to watch them carefully. The little ones try to get a drink of water for themselves from the spout of the kettle of hot water, and thus inflict severe and often irreparable injury upon their throats and their upper air-passages. In many instances, death is inevitable after an accident of this kind. Care must be taken, therefore, that the kettle of hot water, coffee, or whatever it may be, shall be kept out of the reach of children. A similar acci-

dent sometimes occurs with grown folks who are not careful about looking at their medicine bottles, and thus swallow a caustic liniment instead of a medicinal mixture, or administer the same to others. It is a good plan to insist upon it, that the apothecary should put all poisons, liniments, and the like in roughened bottles,—a special kind of which is made for the purpose,—so that the sensation imparted to the hand, in light or dark, will indicate caution, and thus prevent the liability of making such a dreadful mistake.

Scalds of the kind alluded to are apt to be very severe. The cough and spasm produced by the act of swallowing these hot and acrid drinks involuntarily spatters them about the top of the larynx, the upper part of the throat, and even along the nasal passages. Much of the mucous membrane of these parts is killed at once, and there is violent inflammation, with great swelling, sometimes to such an extent as to choke the patient to death, unless the windpipe is opened surgically to allow access of air to the lungs from an artificial aperture. Whenever such an accident occurs, whether in daytime or at night, the nearest reliable physician should be sent for at once, and the mind be prepared to learn that recovery is doubtful ; and that, even if it take place, a great deal of deformity may result, interfering, perhaps permanently, with freedom of swallowing and freedom of breathing.

Ordinary sore throats, such as follow exposure to

cold, usually implicate the soft palate, uvula, and tonsils, and even the base of the tongue. Sometimes the back part of the throat (the pharynx) is involved, but not often. In some instances the upper portions of the air-passages (larynx and trachea or windpipe) are also affected, and in others the nasal passages likewise. The same sort of sore throats is likewise due, in some instances, to the peculiar influence of certain medicines which are being used in the treatment of other diseases. These medicines are chiefly preparations of mercury, iodine, antimony, zinc, belladonna, and stramonium. Whenever, therefore, a sore throat occurs, during treatment for another disease, and there is no ostensible reason to account for it, it is well to have the inquiry made as to whether it might not be the result of the action or overaction, or poisonous action of remedies in use at the time. Sometimes, too, these sore throats are occasioned by what is known in medical parlance as "reflex action;" that is to say, that an irritation of the nerves from a disease in the heart, liver, intestines, or some other organ, may be propagated along the spinal cord, which consists of the combined bundles of the nerve filaments that extend from it to all parts of the body, and then proceed from the spinal cord along the nerve fibres that leave it at another point to extend to the lining or mucous membrane of the throat.

Sore throat, again, occurs from an extension of

various diseases in the mouth, tongue, nose, and windpipe. It also occurs as a part of the ordinary manifestations of scarlet-fever, and likewise, but to a less extent, of small-pox and of measles. It also occurs in connection with a number of acute maladies, such as erysipelas, typhoid fever, rheumatism, influenza, and certain diseases of the skin. It likewise occurs in a number of chronic diseases. The reason why the throat is affected in many of these affections has not yet been satisfactorily determined.

COMMON SORE THROAT.—This is a slight superficial inflammation of the covering or mucous membrane of both surfaces of the palate and uvula, and usually of the mucous or covering membrane of the tonsils also, extending, in some cases, to the same covering of the back part of the throat (the pharynx); but the mucous membrane of the mouth remains free. It is most frequent in children and quite young adults.

The parts affected are red in color, more or less swollen, and secrete an excess of mucus. They are often quite painful on swallowing. Speech is often indistinct, but there is no hoarseness. There is no cough unless the uvula is elongated and tickles the back part of the tongue or the valve (epiglottis) on top of the air-passage.

Sometimes a sore throat of this kind following exposure to wet, is very severe for a day or two, and subsides suddenly to give way to an attack of acute

rheumatism. This form is known as *rheumatic sore throat*, and probably involves the muscles, or the sheaths of tissue in which the fibres of the muscles are enclosed, rather than being confined to the mucous membrane.

In severe cases there is considerable fever, and this is severer in children than in adults. In severe cases, too, the glands at the angles of the jaw become swollen.

It often happens that the sore throat is limited to one side of the body, and then the other side is apt to become affected, as the diseased action subsides in the first locality; and if the individual be imprudently exposed, the second attack is apt to be more intense than the first one.

Unless there is some grave constitutional disorder, this form of sore throat gets well spontaneously in from five to ten days, according to its severity.

Very often, cases of slight sore throat require no special medical treatment whatever. It is prudent, however, to keep in the house, lying upon a couch or bed, with a thin coverlid over the body to equalize the heat of the surface. This precaution will shorten the duration of the attack considerably, and render it less likely to subside into a chronic sore throat, as many neglected cases do. The bowels should be kept relaxed by resort to some mild medicine, as castor-oil, salts, magnesia, or rhubarb. The free use of muci-

laginous drinks, such as barley-water, gum-arabic water, slippery-elm water, and the like, and of small fragments of ice retained in the mouth until melted, if agreeable, as they almost always are, will soothe the pain in the throat. Intense heat of the skin may be allayed by sponging the body with acidulated tepid water, bay-rum and water, or alcohol and water. This, with restriction to a very light and easily digested diet for a day or two, will be all that will be required in moderate and ordinary cases. Severe cases require the advice of the physician.

QUINSY.—This is a severer form of sore throat, in which the inflammatory action is not confined to the mucous membrane, but involves the tissues beneath it. It is quite liable to go on to what is called suppuration, or the formation of pus. The organ most prominently involved is the tonsil; but the palate and uvula, the base of the tongue, the valve of the air-passage, the back of the throat, and the tissues that connect these various structures are all liable to be involved to a greater or less extent. It occurs more frequently in individuals with diseased tonsils than in other persons, and is most frequent in children and young adults. It is more dangerous in children than in adults, and in individuals with enlarged and diseased tonsils.

Quinsy usually begins with a chill, and this is followed by fever within twenty-four hours. Pain in

the throat is an early symptom. All the visible structures of the throat are inflamed and swollen, the tonsils in particular — sometimes only one of them, sometimes both of them, but usually one much more than its fellow. The swollen tonsil may project beyond the middle line of the throat, or the two tonsils may touch. They are usually covered with whitish or yellowish creamy secretions. The pain in the tonsil sometimes runs up along the fold behind it into the ear, with the vent-hole of which it is continuous (see page 15). There is indistinctness of speech, difficulty and pain in swallowing, and difficulty of breathing if the swelling is very great. The parts become dry, taste is impaired, and the breath offensive. Sometimes the saliva dribbles from the mouth because it cannot be swallowed. Sleep becomes difficult or impossible when the mechanical impediment to breathing is great, or when the nervous system is excited by fever and suffering. Children are liable to delirium and convulsions.

The disease lasts longer than common sore throat; and though the tendency of the attack is to recovery in most instances, there are not a few in which it is fatal from the formation of burrowing abscesses, which inflict irreparable injury. In many instances an abscess forms in the tonsil, and when this bursts spontaneously, or is discharged by the surgeon's knife, relief to pain is usually immediate, and the inflam-

matory process soon subsides, provided there are no more abscesses. An abscess that bursts spontaneously may suffocate the patient by flooding the air-passages; but this is infrequent. It is best and safest, however, to submit to an operation, if suggested by the medical attendant. A child, tormented for days by sleeplessness from pain, will sometimes go to sleep on the lap of its mother or nurse, after the discharge of such an abscess, even before the surgeon has wiped his knife.

Nothing is said about treatment of these cases, as they are too important to be intrusted to untrained hands. It is quite likely, however, that the use of gargles will be suggested in the treatment of this disease. They are rarely of any service, chiefly because their use entails a great deal of pain. They may be entirely superseded, in the treatment of this and other forms of sore throat, by the use of sprays or douches propelled from the so-called atomizer, so frequently in use for diffusing sprays of cologne water and the like. The use of these sprays entails no pain, is really grateful and soothing, and the fluids reach the remoter parts of the throat which are never reached by the gargle. A gargle as ordinarily used only reaches the palate and base of the tongue, as a rule, as may be seen by experimenting with colored water — indigo water, for example. To reach the back part of the throat, it must be half swallowed; a dif-

ficult practice, and too painful for the subject of a sore throat. It is better to try and bring the fluid of the gargle in contact with the sore parts by holding it in the mouth, and then gently turning the head to one side and to the other, backward and forward, so as to let the fluid bathe the parts in succession, without making any gurgling noise by forcing the air through it as in the usual method. Another good plan is to carry the fluid back to the root of the tongue in a teaspoon, and then pour it over the parts as the head is thrown back, which will bring it in contact with the deeper structures of the throat; then the sides of the throat are bathed by appropriate motions of the head to either side; and the process is completed by suddenly bringing the chin down to the breast as the fluid is ejected, so as to bathe the middle portion of the throat, the tonsils, palate, and roof of the mouth.

Common Membranous Sore Throat.— It is highly desirable that the public should be aware that there is a comparatively unimportant disease of the throat in which the structures become covered with a membranous deposit, and which is often mistaken for diphtheria. The tendency in this disease being to spontaneous recovery, and the disease being mistaken for diphtheria, certain remedies are apt to be vaunted as efficient in diphtheria, because they happened to be used vigorously in a case of common membranous sore

throat which would have gotten well under ordinary management.

This affection occurs at all seasons of the year. Some individuals are attacked almost annually. Its most frequent immediate cause is a cold bath, or other exposure to cold, while the body is overheated or in active perspiration. Imperfect drainage and emanations from cesspools and refuse-heaps are often the apparent remote cause. During the prevalence of diphtheria, common membranous sore throat is often contracted by persons susceptible to sore throats from other causes, and may then become a starting-point for the severer disease.

It usually begins with a chill, followed by fever, which is sometimes quite severe; then there are two or three days of ordinary sore throat. At first, the palate, tonsils, or pharynx are covered with groups of little vesicles, which burst, become excoriated, run into each other, and get covered by a grayish-white pellicle or membrane, resembling the similar false membrane of diphtheria, which begins, however, in another way and under other conditions. The various parts of the throat are swollen, but not nearly as much as in quinsy, and the affection is usually confined to one side. A similar form of sore throat sometimes attends advanced stages of consumption in which there has been severe disease of the throat. The disease usually subsides spontaneously in from

eight to ten days. Sometimes it is fatal, however, chiefly in children, from extension of the membrane into the air-passages, death taking place mechanically by suffocation. It is difficult to distinguish this affection from diphtheria, especially when the latter is prevalent; but there is not that profound disturbance of the system due to blood-poisoning, which is the chief characteristic of diphtheria.

Common membranous sore throat often occurs again and again in some individuals, which is not the case with diphtheria. The appropriate treatment for this affection is that for ordinary sore throat, with such cleansing and astringent washes, sprays, and lozenges as the attendant physician deems suitable.

THE SORE THROATS OF SMALL-POX, MEASLES, AND SCARLET-FEVER.—The sore throat of small-pox is due to the development of an eruption upon the surface of the throat, mouth, and air-passages similar to that which is developed upon the skin. It is liable to be followed by permanent hoarseness in those who recover; and is quite apt to terminate fatally by ulceration in the air-passages.

The sore throat of measles is a catarrhal inflammation of the nasal passages, throat, and air-passages. The mucous membrane of the throat is often affected a day or more in advance of the skin, the palate being covered with small red points. It is liable to be followed by prolonged hoarseness.

The sore throat of scarlet-fever is very severe in some instances, to such an extent, indeed, as to be the main source of danger in that serious malady. Some amount of sore throat attends every case. In some cases it is the only manifestation. Susceptible nurses and physicians are liable to have sore throat nearly every time they are in attendance upon scarlatina. There is a diffuse inflammation of the throat, sometimes with small, pimple-like eruptions, and these manifestations appear a day or two in advance of the manifestations on the skin.

The inflammation is of a high grade, not unlike that of quinsy in moderate cases, and proceeding to ulceration and great destruction of tissue in severe cases. The inflammatory process is very apt to extend up into the drum of the ear and produce an abscess, which ruptures through the drum membrane and discharges externally at the outer ear. Many diseases of the ear are due to the sore throat of an attack of scarlet-fever. It is popularly believed, and sometimes taught by physicians, that children will "outgrow" such affections. Nothing can be more erroneous. Every such case demands immediate and skilful treatment, in spite of which, not infrequently, hearing is often impaired or lost.

CHAPTER IV.

DIPHTHERIA.

DIPHTHERIA is one of those maladies known as blood diseases; that is to say, it is due to some deleterious matter that gets access in some way to the mass of the blood, and poisons the system. The nature of this poisoning material has not yet been detected, but there is reason to believe that it flourishes where drinking-waters, and the air of dwelling-places, are impregnated with emanations from cess-pools, refuse heaps, waste-pipes, and unventilated sewer-drainage. The disease is propagable by contagion; and one attack does not insure immunity from subsequent ones. Children are much more liable to it than adults. It is characterized by a low or typhoid type of fever, and more particularly by the development of a more or less copious deposit of what is termed false membrane on the mucous surfaces of the throat and adjoining cavities, the air-passage and nasal passages. Sometimes it extends along the gullet even into the stomach. It is likewise liable to be formed over any abraded portion of the skin. The

character of the deposit varies from minute, delicate films to large, tough membranes, sometimes amounting to complete casts or moulds of great extent. The deposit is usually more or less diffused over the surfaces. The deposit may accumulate to such an extent in the air-passages as to produce death by suffocation; but the more frequent cause of death in this notoriously fatal malady is extreme depression of strength and vitality, the result of the poison in the blood.

The disease rarely occurs without exposure in some way to the cause of the infection, though it is sometimes impossible to trace it to such an occurrence. Two to five days usually elapse between this exposure and the outbreak of the disease; but this period may be but a day on the one hand, or be extended to two weeks on the other.

The earliest manifestation to attract prominent attention is usually some degree of sore throat, often confined to one side, and attended with swollen glands below the ear and lower jaw of the same side, or both sides, as may be; these parts being tender and painful. Sometimes the swelling begins in the parotid gland in front of the lower part of the ear,—the same gland which is swollen in mumps. The throat becomes swollen inside, where it soon becomes more or less overlaid or covered with a whitish deposit, usually commencing on the tonsil or the palate, and thence

gradually spreading; but it may begin at points out of the line of sight, and thus escape detection. Cases occur, too, in which there is no local manifestation of deposit to be detected at any time. If the air-passages are to become involved, they become covered with the membrane within a day or two of its appearance in the upper part of the throat, or at least, except in rare instances, before the termination of the first week. When the air-passages are involved, the special symptoms are similar to those to be mentioned under the head of croup, and which become superadded to those of sore throat. While the deposit is spreading, the patient usually becomes more and more prostrated in strength. The disease is very apt to terminate fatally, especially in delicate and feeble persons, death taking place within a few days in some cases, and towards the end of the second week in most of them; exceptionally not until four or five weeks. Manifestations of recovery are usually presented between the eighth and fourteenth day in most instances. Paralysis of the throat is not infrequent after recoveries from diphtheria, and the paralysis may extend to other parts of the body, especially the legs, and may even involve the heart and lungs, when it will be fatal. The eyesight is not seldom seriously affected from paralysis of the muscle of accommodation or focusing.

The treatment of diphtheria must be pursued under

the direction of the physician, whose efforts are chiefly directed to sustaining the vital forces of the patient, providing for nutriment, and endeavoring to get rid of the accumulations in the throat, nose, and air-passages. There are some general points, however, with which heads of families should become familiar. The patient should be isolated as much as practicable, to prevent spread of contagion; and all the clothing, food and bed-utensils be at least partially disinfected before they are removed and carried through the house. Carbolic acid water is the most available agent for this purpose in most instances. The mode of using it may be learned from the physician. Carpets, curtains, and stuffed furniture should at once be removed from the sick-room, which ought to be at the top of the house, and well ventilated. After the case is over, this room and all it contains should be thoroughly disinfected by exposure to the fumes of burning sulphur, in order to lessen to a minimum the danger of infection for future occupants. When the deposits in the throat are dry and adherent, it is considered very important, by many physicians, to keep up an abundance of moisture in the room by means of dishes of boiling water, wet cloths hanging about, and the like, in the hope of keeping the matters in a fluid state, so that they may be more easily expelled from the body. Systematic inhalations of steam are also used at appropriate intervals in addition. When the mem-

branes are in the air-passages, it is very important that they should be coughed out, lest they accumulate in quantity dangerous to breathing. To favor their detachment and expulsion, it is customary with many physicians to see that a large stock of unslaked lime is in the house. When the dreaded time comes, this lime is broken into fragments the size of furnace coal, and a few of them at a time are slaked by the bedside, the fumes from the lime being directed towards the mouth of the patient by some extemporized method, such as covering the vessel with a big paper bag, as a flour bag, with one of the corners torn out so as to direct the fumes through it. This process is repeated every half-hour, hour, or at longer intervals, as may be required. Sometimes, in addition, a piece of lime is kept in a vessel of heated water by the bedside, so as to maintain a continuous evolution of steam and lime particles. The lime gets into the air-passages and detaches the membranes, and the steam gets beneath them through these inlets and loosens them, so that they can be coughed up. The masses may accumulate in the throat and mouth and the patient be unable to eject them; and they may require removal with the finger of the nurse or attendant.

In some cases where the upper air-passage becomes so occluded, or so paralyzed that sufficient air cannot get through to sustain life, it becomes necessary for a surgeon to cut a hole into the windpipe, and keep it

open, until the passage above becomes sufficiently pervious again. This operation (tracheotomy) is not always successful. More than half the children operated upon die in spite of it, and it is very rarely indeed that it saves the life of an adult. The reason is that the air-passage of the adult is so large in proportion, that the disease in the smaller tubes is too far advanced for recovery before the larger calibre of the air-passage gets obstructed. The operation is perfectly justifiable in children, however, and hundreds are saved by it from otherwise inevitable death. It permits them to breathe while they are going through the course of the disease towards death or recovery, as may be, but is not in itself curative. The earlier it is performed, after it appears requisite, the better the chance of saving life by it.

The importance of this operation is so great, that it is questionable, in many instances, whether parents are not culpable in refusing to allow their children this chance for life when urged upon them by their medical advisers. The fact that no certain promise of success can be given by the surgeon in any one case, does not begin to counterbalance the fact that lives are often saved by it, even under conditions apparently utterly hopeless, occasionally even directly after the patient has ceased to breathe. Even when unsuccessful in saving life, the operation often ensures freedom of breathing, and saves a dreadful death by

suffocation. The ease which follows, justifies the operation merely as an alleviator of distress.

Another point which should be realized by parents is the great danger of lifting a patient, low with diphtheria, in disobedience to the physician's injunctions. The heart becomes so feeble, at times, that the extra exertion necessary to pump the blood into the upper part of the body against gravity is too much for it, and it ceases to beat. The physician knows when this is imminent, and tells the attendant *not to allow the patient to rise or be raised for any purpose whatever*, until he deems such precaution no longer necessary.

CHAPTER V.

CROUP.

THERE is a spasm of the air-passage sometimes called pseudo-croup or false croup, (see page 78 ;) but it is of nervous origin altogether, and has no affinity with croup other than that the main symptom is always spasm, which also occurs in some cases of croup, though by no means a constant manifestation.

True or membranous croup is chiefly an inflammatory disease of the upper air-passage, attended with the deposit of a membrane like to that which accumulates in the air-passages in diphtheria. The deposit may extend along the windpipe, and even great distances along the bronchial tubes and their ramifications. There are no reliable chemical or microscopic tests which can distinguish between the deposits in croup and in diphtheria. On this account many physicians consider the two diseases to be identical. Others, among them the author, believe that they are not identical, and that there is no primary or special blood-poison at work in croup as in diphtheria; and that the danger to life in croup resides

wholly in the locality of the inflammatory process and its mechanical results. In this view, croup is not to be regarded with the same dread as diphtheria, though it is also often fatal. It rarely attacks adults.

The false membrane in croup sometimes exists in the accessible portions of the throat, and then its resemblance to diphtheria is so great, that only the absence of the symptoms of a low form of fever can distinguish it.

A frequent cause of inflammatory or true croup, if not the chief one, is the vicious method, so much in vogue by silly and vain parents, of leaving children partly undressed, to show off their pretty necks, shoulders, and legs. This practice causes an unequal temperature of the surface, and renders the little victims of parental vanity extremely susceptible to ill effects from slight exposure to cold and dampness.

The special symptoms of croup are hoarseness, soon increasing to loss of voice, with increasing difficulty of respiration, attended at times by severe and noisy efforts of inspiration, and sometimes terminating in suffocation from accumulation or unfavorable position of the false membrane, or even, at times, from spasmodic closure of the upper part of the air-passage, or paralysis of the muscles that keep it open during health. There is usually some little fever with slight catarrh or cold for a day or two, attracting but little attention, with a moderate amount of cough and hoarseness. Then there is a flushed face, towards

evening generally, with undue brilliancy of the eye, increased heat of skin, and abnormal frequence of pulse; and towards midnight the little patient is awakened with a paroxysm of difficult breathing, often the first symptom to excite alarm. The cough becomes shrill and harsh, like the sound of a cock's crow or a blast through a brass trumpet. The cough and the voice gradually become muffled, and finally may become extinct, so that the child is seen to cry and cough without making noise enough to attract attention. The difficulty of respiration increases as the matters accumulate in the air-passages; and the soft parts above the chest, below the chest, and between the ribs, become more or less deeply indented or depressed by external atmospheric pressure at each ineffectual attempt to expand the lungs by inspiration. The child tries to grasp something to help its breathing, often clutches at its throat, and exhibits the most unmistakable evidences of threatening suffocation. If not relieved spontaneously or otherwise, the flush fades from the face, the lips become pale and then livid, perspiration pours out over the surface, and the efforts at respiration become less and less vigorous, until they cease in the death struggle.

In the treatment of croup there are the same indications for the use of steam- and lime-fumes as in the analogous condition of diphtheria, as well as for the operation of incising the windpipe for access of

air to the lungs when there is uncontrollable occlusion above it. In the two diseases, the great points promising success, are a disposition to cough and a desire for food; and everything should be subservient to encouraging these conditions. It is highly necessary that skilled assistance be continuously at hand for at least the first twenty-four hours after the windpipe has been opened, as the life of the child may be imperilled by sudden occlusion of the artificial passage, demanding instantaneous attention to avert immediate death. The chances of saving life by timely tracheotomy in true croup are infinitely greater than they are in diphtheria, because there is no blood-poison at work, and the main indication is fulfilled if the mechanical obstruction to respiration is overcome. The foreign matters are to be viewed in the light of foreign bodies accidentally inhaled into the air-passages and threatening suffocation from mechanical obstruction to the access of air to the lungs. If the accumulations in croup plug up the smaller air-passages, or even the windpipe below the point at which an opening can be made, the chances of success from the operation are diminished. To be successful, the operation must not be delayed too long; for if carbonic acid accumulates in the blood from prolonged want of due oxygenation, the patient may die, poisoned from this cause, even several days after a tracheotomy successful so far as procuring freedom of respiration is concerned.

CHAPTER VI.

ACUTE LARYNGITIS.

LARYNGITIS is the name employed to designate inflammation of the larynx. Acute laryngitis is a severe inflammation of the larynx, very apt to be confounded with croup, when it occurs in children, and with various other affections in both children and adults. It is exceedingly dangerous to life because a moderate amount of swelling, inseparable from severe inflammation, which would be of much less immediate importance in any other part of the body, is liable here to close up the narrow air-passage to such a degree as to interfere with breathing, and thus lead to death by choking or suffocation. A violent form of laryngitis, due to accidental swallowing or inspiration of acrid and caustic substances, has already been alluded to (page 30).

The special affection to which attention is here directed, however, is an inflammation of the lining membrane of the larynx, due usually to sudden exposure to cold, in a person subject to severe sore throat, or convalescing from some disease in which

the throat has been affected. It also occurs, under similar circumstances, during the chronic sore throat that attends many cases of consumption of the lungs. Sometimes it is due to prolonged or violent screaming, or other excessive use of the voice; sometimes to inhaling some noxious matters in the air; sometimes to extension from some local disease in the mouth or jaw, as an inflamed gum during teething, and the like. Sometimes it is the result of the poisonous action of certain drugs, when given in excess or injudiciously, especially those containing mercury, antimony, and iodine.

In some cases the inflammatory action is confined to the larynx; in others, it is associated with similar disease in the windpipe, or in the upper part of the throat. The great danger in this disease is the formation of a dropsy of the tissues, which become filled with watery fluid which has oozed out of the blood-vessels, and then flap like loose bags upon the top of the windpipe at each inspiration, and so prevent due access of air to the lungs.

The disease usually begins with a chill, soon followed by fever, and before long by sore throat. The patient complains first of pain in the larynx, which is increased by talking, coughing, or access of cold air to the parts; and there is after awhile a sense of constriction, as if something had gotten into the top of the air-passage, or something were squeezing it from the outside. Sometimes there is spasmodic catching

of the breath. These signs are soon followed by actual difficulty of breathing, and with difficulty in swallowing. The voice is hoarse, and its exercise often painful. The sounds of breathing become harsh, like in croup. There is a similar sort of cough, too, usually accompanied by expectoration of phlegm or mucus, which gives relief for the time-being.

Mild cases usually get well in from five to eight days or more; but they are liable to become severe suddenly. There is no way of absolutely determining the condition of the parts without examining them by means of a mirror placed in the back part of the throat so as to reflect the light down (*laryngoscopy*); but the general symptoms and history of the attack are usually sufficient to indicate its nature.

The treatment requires the assiduous care of the intelligent physician, and valuable time may be irreparably lost by attempting home treatment. Pending the arrival of a physician, the patient should be put to bed, with iced cloths around the throat, and bits of broken ice should be at hand for almost constant use in the mouth; while a smart purge of half an ounce or an ounce of Epsom-salts, for the adult, should be promptly administered, so as to produce one or more full watery evacuations from the bowels.

After recovery from an attack of acute laryngitis, great care should be exercised, for some weeks, in avoiding everything which might be liable to induce sore throat.

CHAPTER VII.

CHRONIC SORE THROATS.

CHRONIC SORE THROATS are sore throats of considerable duration — weeks, months, or years, as the case may be; the patient, as a rule, not being confined to the house, unless suffering from some enfeebling malady, or very much reduced by the sore throat itself.

In some cases they are the result of one or more attacks of acute sore throat. In others, they are the gradual result of prolonged exposure to irritating dust, chemical products and the like, as in storekeepers, factory hands, stone-cutters, stokers, photographers, workmen in chemical laboratories, and so on. Then, again, they occur without any assignable cause, attracting little attention until they have existed for a long time.

SIMPLE CATARRHAL CHRONIC SORE THROAT is the mildest form of the affection. It affects the mucous or covering membrane of the palate and pharynx, and, not infrequently, of the back part of the tongue also, and even the floor of the mouth far back. It is rec-

ognized by the bulging forward of the mucous membrane in irregular ridges. The membrane looks red and pasty-like, and is often overlaid by enlarged and tortuous blood-vessels. There is an irregular accumulation of mucus or phlegm at various points. The general health is often unimpaired, though there may be languor and indisposition to exert one's self. It is often merely an indication of disorder of the stomach or some other portion of the digestive tract.

The symptoms are those of local discomfort in the throat, with dryness of the parts, and a disposition to expectorate the phlegm that accumulates from time to time; but actual cough is not frequent, except to clear the throat out on rising in the morning. An unpleasant and disagreeable taste in the mouth is often a marked feature of the complaint.

As the disease is usually associated with disease of the digestive apparatus, proper attention to the latter will often cure the sore throat without special treatment. Where this does not suffice, or where the disease is not associated with disease of the digestive apparatus, soothing solutions in sprays are indicated — warm, tepid, or cold, as may be most grateful to the parts. Severe measures, such as cauterization and swabbing out of most kinds, are more apt to be injurious than beneficial. Gargles rarely reach all the diseased structures, and sprays are therefore to be preferred. (See page 37.) Lozenges of gelatine,

gum-arabic, real marsh-mallow (not the factitious marsh-mallow paste and gum-drops sold in the shops, which do not contain an iota of marsh-mallow), extract of liquorice, and the like, are often of great service. It usually requires a number of months to get rid of the affection, but the cure is apt to be permanent. When smoking keeps up the sore throat, or prevents it cure, the habit must be abandoned or suspended.

CHRONIC FOLLICULOUS SORE THROAT is a severer grade of sore throat than that last mentioned, and is the most frequent form of the affection in the United States. It consists not only in disease of the mucous membrane, but, also, and especially, in disease of the glands (or follicles) which are imbedded in the mucous membrane. It is that form of sore throat popularly termed *clergyman's* or *clerical sore throat;* but it is by no means confined to the clergy, or even to individuals who make special use of the voice, although very prevalent among them, and often due to improper or injudicious use of the voice, especially when suffering from slight sore throat, as will be detailed in the latter part of this volume. Its prevalence among clergymen seems to be in part due to the inequalities of temperature to which they are often subjected in the performance of their duties, with bare head exposed to draughts from open windows or in the open air. It has often been stated

that clergymen who preach extemporaneously or without manuscript, are less liable to the complaint; and this may be so, as far as the constrained position of reading from a desk interferes with the freedom of respiratory movement so essential to the favorable use of the voice without sensible effort. It occurs very often in wine-bibbers. It is not confined to the structures mentioned in connection with the simple catarrhal form of chronic sore throat (page 56), but is apt to involve the glands at the posterior portions of the nasal passages, the roof or vault of the pharynx, the glands in the base of the tongue and floor of the mouth, and those in the outer and inner mucous membrane of the larynx. It often occurs in scrofulous persons, in those subject to diseases of the skin, in those predisposed to consumption, gout, rheumatism, and other hereditary maladies, but is by no means confined to these classes of individuals. It is more frequent in the delicate than in the robust.

City life seems to favor the development of this affection, the evil results being due to inhaling the dusts, chemicals, and decomposing emanations, and so on, in the atmosphere of great manufacturing communities. These irritate the mucous membranes with which they come in contact, and set up an unhealthy secretion from the glands, which eventually stops up their outlets, and causes them to enlarge in the manner characteristic of the complaint.

The earliest intimation of the disease is usually a sensation of dryness in the throat with a disposition to expectorate, which may comprise the sum total of symptoms for a period of indefinite duration. If the disease continues, there will be more or less hoarseness, sooner or later, with inability to depend upon the voice for any unusual use of it. There may be some difficulty in swallowing, as the disease progresses, and some degree of impairment of hearing. There is rarely any actual pain in the parts, but rather a sense of discomfort as from the presence of some material which ought not to be there. Headache is apt to occur when the disease involves the top of the pharynx at the base of the skull. Dyspepsia and other disorders of digestion are not uncommon. The saliva and other secretions from the glands of the mouth, being wasted in expectoration and deteriorated in quality, are unfit for their normal use in assisting the digestion of starchy articles of food, which, therefore, reach the stomach but partially prepared for stomachic digestion, and excite dyspepsia. Indigestion impairs the quality of the blood, and brings in its train undue coolness of the extremities, and other evils. Though a general condition of impaired vigor ensues, there is rarely sufficient sense of ill-health to interfere with the customary requirements of business or other occupation ; but all the ordinary

work is done with some amount of effort to keep up to the work.

If the disease progresses,—and it often remains at a stand-still,—the symptoms become aggravated, especially after unusual exertion or exposure. The voice may become so impaired as to interfere with the performance of public duties. Cough is more frequent, and the expectoration more viscid, and often accompanied by painful sensations deep down in the throat or at the root of the tongue; the patient becomes nervous, and experiences difficulty in swallowing at times, and in breathing at times; all of which adds to the mental disturbance that begins to be manifested, lest the disease be associated with disease of the lungs, or be indicative of some incurable malady.

The characteristic local manifestation of the disease is a series of groups of enlarged follicles in the back part of the throat, easily recognized as small, irregular, red elevations at various points of the surface. With this the outlines of distended blood-vessels are more or less prominent. Strands of unhealthy mucus sometimes adhere to the throat. The general surface often looks excoriated as if something rough, like a fragment of sandstone or a small nutmeg grater, had been drawn over it. It is very rarely, indeed, that these enlargements undergo ulceration, and when they do, it is in individuals either much broken down in health, or of decidedly scrofulous constitution.

It is a significant fact, that this disease of the throat does not, as a rule, follow a direct line down into the gullet or food-pipe, but goes along the larynx or top of the windpipe. This is due to the constant patency of the air-passage, while the food-pipe is only open during the special acts of swallowing. The special symptoms of this disease are impairment of voice, impairment of swallowing, impaired respiration, cough, impairment of hearing, and pain. These occur in varying grades, and are not all present in every case.

Impairment of voice includes all degrees of feebleness and hoarseness; and its manifestations may be intermittent or more or less continuous. It is usually due to involvement of the mucous membrane and glands of the larynx; but is sometimes altogether due to reflex action in the great pneumogastric nerve, which supplies both pharynx and larynx, as well as other structures. Just as a sip of water swallowed during an address, although it does not enter the larynx, where it would excite cough, clears up a momentary hoarseness by the reflex action of the cold and moisture transmitted from the pharynx to the larynx, just so a disease in the pharynx may produce manifestations in the larynx, without there being any direct involvement of the tissues of the latter.

Impairment of swallowing may be extremely trifling, and vary from that grade even to actual inability to swallow, though this extreme is rare. In some in-

stances the effort of swallowing is usually attended with pain, and sometimes with spasmodic sensations. Sometimes it is altogether nervous. Sometimes it is due to enfeeblement of the muscles from actual loss of substance. Occasionally it is due to ulceration.

Cough may be limited to a mere "hem" to rid the parts of uncomfortable sensations, and vary to extreme efforts to get rid of tenacious mucus that clings in strands to the abraded mucous membrane. In severe cases, especially when there is ulceration, the expectoration may be occasionally tinged with blood from rupture of delicate blood-vessels in violent paroxysms of cough.

Impaired respiration is usually nervous and reflex. In some instances, however, the glands in the upper part of the pharynx, and in the region bounding the outlets of the nasal passages into the throat, are enlarged, and occlude the nose behind, so as to compel almost continuous breathing through the mouth.

Impairment of hearing sometimes attends this disease, and is occasionally permanent, even after the throat has been cured. It is due to an extension of morbid disease up the vent-tubes of the drum of the ear, which open into the throat, one on each side of the respective posterior outlets of the nasal passage. In fact, the great majority of cases of impaired hearing from disease of the drum of the ear, and its contents and connections, are due to extension of

disease of the throat propagated in the direction just indicated.

Actual pain is infrequent, but uncomfortable sensations in the throat, as from minute or adherent foreign bodies, such as hairs, bristles, and the like, are quite common.

Enlargement or prolongation of the uvula so that its tip tickles the base of the tongue, or even the epiglottis, exists in some instances, and produces such disagreeable tickling as to provoke cough to get rid of it.

The treatment of this affection is tedious, but may be almost always satisfactory if properly instituted. Constitutional treatment is required in most instances, appropriate to the demands of the case, in maintaining the functions of the skin, stomach and intestines, and other organs, in as healthy a state as practicable. Any hereditary taint of scrofula, gout, rheumatism, or the like, requires appropriate measures accordingly. Tonics are often required. In certain cases, what are called nerve-tonics are especially requisite. Local treatment of the throat is almost always necessary. This consists in certain applications to the diseased follicles, for the purpose of getting rid of them by absorption, if practicable, or by actual destruction, if necessary. This requires careful manipulation at the hands of the medical attendant, or a duly qualified assistant, who has been carefully instructed by the

physician. It cannot be done effectually by one's self. In addition to this, the frequent use of sprays, such as have already been mentioned (page 37), are likewise of advantage.

Rest from vocal effort is often imperative, and in many cases absolutely indispensable to a cure; especially in those individuals to whom the use of the voice is a means of livelihood. It is chiefly the impracticability of resting the vocal organs that prolongs the treatment of the disease. Improper methods of speaking must be corrected. (See Improper Use of the Voice, and Care of the Voice.)

CHAPTER VIII.

ENLARGED TONSILS.

ONE form of chronic sore throat consists mainly in a permanent enlargement of the tonsils. It is most frequent in children and young adults, and it rarely occurs after the thirtieth year. Sometimes it is congenital, or at least noticed very shortly after birth. It usually occurs in individuals whose constitutions are imperfect from scrofula or other hereditary taint, or have become impaired by acute or chronic disease followed by impoverishment of the blood, as it is termed.

The enlargement varies from the merest increase of volume to a size as large as walnuts, the two tonsils touching each other, and pushing the palate forward. They are likewise apt to be enlarged upward and downward. The condition is readily recognized on inspection of the throat through the open mouth, and the extent may be determined by following the outline of the gland, beyond sight, with the finger. The tonsils are often diseased, and adherent to the folds of the palate.

The symptoms are impairment of articulation, attended in some cases with impairment of respiration and swallowing. The mouth is often kept habitually open; the throat is dry from rapid evaporation of its moisture; there is snoring in sleep, and the voice has a nasal twang. The necessity, sometimes existing, for bending the head forward, or toward the side least affected, in order to breathe effectually, may give rise even to permanent deformity of the chest walls. The impairment of respiration leads to insufficient oxygenation of the blood, and eventual general ill-health. In extreme cases, suffocation is at times imminent, and death may occur rather suddenly from this cause.

The treatment of enlarged tonsils is both constitutional and local. In cases of moderate severity, and of recent standing, constitutional treatment, alone, may be adequate to a cure. In most instances, local treatment is necessary; and in very many it becomes absolutely requisite to remove a considerable portion of the diseased glands by surgical interference, — a perfectly safe and advisable procedure.

CHAPTER IX.

CHRONIC LARYNGITIS.

THIS is a chronic or long-continued inflammatory disease of the larynx, or larynx and windpipe, which may simply involve the lining and covering mucous membrane, or the lubricating glands in the membrane, or the tissues beneath, including the blood-vessels, nerves, muscles, and even the framework or skeleton of the parts. Sometimes it follows as the result of one or more attacks of the acute inflammatory affection of the same parts. Sometimes it is part and parcel of a chronic bronchitis or inflammation of the air-passages generally. Sometimes it is due to over-use or abuse of the voice; sometimes to the irritating effects of dust and other matters inhaled. Sometimes it is part and parcel of a certain variety of consumption of the lungs, in which case it is popularly known as consumption of the throat; but it is not positively known to exist in this form, unless the lungs are already in a state of disease.

Chronic laryngitis of all kinds is more frequent in adults than in children, and in males than in females.

When the disease is confined to the mucous membrane, it is usually in what is known as the catarrhal form, characterized by an excessive secretion of mucus or phlegm, which is expectorated by coughing. There are occasional or temporary sensations of pain in the parts, with more or less hoarseness, and, in some cases, a certain and variable amount of impairment in swallowing; but the general health is fairly good, unless the amount of secretion is very great and exhausting. The expectoration of mucus is usually greatest on rising from bed in the morning, to evacuate the accumulation over night. The affection is sometimes associated with the forms of chronic sore throat already described.

In some cases, as in scrofulous subjects, and especially in those of consumptive tendency, the disease is manifested to a great extent in the glands of the mucous membrane. These glands increase in size and in number; and when this takes place at the upper inlet of the air-passage, as is most frequently the case in the beginning, there may be sufficient swelling to interfere seriously with comfortable breathing, and to a certain extent with freedom in swallowing. There is greater cough and expectoration than in the simply catarrhal form of the disease, which always coexists with this glandular form.

In consumptive individuals, the glands eventually ulcerate, and sores are left, which very rarely heal of

themselves, or even under the most judicious management. The disease also penetrates into the deeper tissues, which are often destroyed and coughed out in small fragments. Sometimes an acute inflammation is produced by the disease of the skeleton or cartilages of the larynx, and dropsy of the parts occurs, somewhat like that described in connection with acute laryngitis (page 54); but it is more gradual, and rarely as extensive. On the other hand, it is much less susceptible of cure or amelioration. Indeed, the great majority of cases are not at all susceptible of cure. When this ulceration occurs, it is almost always evident that it has been preceded by ulceration of the lungs, and the two processes are almost certain to exhaust the individual. As the disease progresses, the hoarseness increases often to loss of voice. Towards the last, swallowing becomes extremely difficult, and absolutely impossible in some cases, so that there is an unhappy prospect of starvation, if it is impossible to nourish the invalid by means of the stomach-tube, or by nutritious fluids thrown into the bowel. The disease is rarely very rapid in its course; not quite so rapid, indeed, as in the severer forms of slow consumption of the lungs alone; the average tenure of life, after the development of the disease, being from four to seven years under good management.

The only means by which this disease can be de-

tected in its earlier stages is by the use of a little mirror passed into the mouth so as to reflect the image of the parts upon its surface. A pallid condition of these parts, with evidence of glandular swelling at the top of the windpipe, always indicates the suspicious character of the affection; and if there is impairment of the lungs, and a consumptive family history, there is rarely any doubt as to its nature.

The treatment of the disease consists in all those measures of invigoration which are practised in consumption of the lungs; with such local treatment, by inhalation and otherwise, as the condition of the larynx and windpipe may require. These can only be judiciously instituted under the supervision of the physician. Attempts at home treatment, without medical advice, are injudicious, and likely to cause the loss of valuable time; for it is only in its earlier stages that the disease is at all susceptible of cure.

Many cases of sore throat, with loss of voice, cough, and difficulty in breathing and in swallowing, are attributed to this throat consumption, when they are due to some other and much more remediable cause.

CHAPTER X.

FOREIGN BODIES IN THE THROAT AND WINDPIPE.

FOREIGN bodies sometimes become lodged in the throat or windpipe. These may be ill-fitting plates of false teeth;* large morsels of food or fragments of bone arrested, or "going the wrong way" during eating; pins and tacks and the like held in the mouth temporarily; toys, coins, and other objects placed in the mouth during play, and so on. If the foreign body be arrested in such a manner as to prevent breathing, sudden death by suffocation may ensue.

The usual symptoms of the entrance of a foreign body in the throat or air-passages, are sudden paroxysms of pain, or coughing, and gasping for breath. Sometimes the paroxysm is immediately fatal, as has been mentioned. In most instances the intruder is expelled. In a great number of cases, a foreign body remains in the air-passage and cannot be expelled by voluntary effort. It then produces repeated paroxysms of cough and suffocation, more or less frequent, according to the position of the foreign body, which may vary from time to time.

* Plates of false teeth should always be removed on going to sleep, for fear of an accident.

An individual with a foreign body in the air-passage is never safe. A fatal paroxysm may ensue at any moment, on slight provocation. It is essential, therefore, that due efforts be made for its removal or expulsion. In many instances it becomes requisite for the surgeon to make an artificial opening into the air-passage (tracheotomy), and extract the body thence with forceps.

In cases of the kind, a physician should be promptly summoned. Pending his arrival, attempts may be made to excite vomiting by tickling the throat deep down with a feather; or to excite effective cough by bending the body well forward and having some one strike the back smartly during each successive act of cough. Small children can be held up by the legs, head downward.

Should the body not be expelled, and the paroxysm cease, rest of body should be enjoined until skilled assistance can be procured. Irrational and haphazard efforts to get rid of the body are very apt to be injurious. Attempts may be made to reach the body by the forefinger, which can sometimes be hooked around it to detach it when high enough up. Sometimes, when the body is a smooth one, as a pebble or coin, and is caught in the windpipe, it may be removed by letting the individual bend himself backward towards the floor from the arm of a sofa or the like, upon which he is first to sit, when the body will roll down by gravity into the mouth.

CHAPTER XI.

TUMORS IN THE THROAT AND WINDPIPE.

WARTS and various other tumors are developed in the throat and windpipe, just as in other regions of the body. They give rise to cough, hoarseness, and difficulty of breathing, swallowing, or articulation, according to their location, size, and mode of attachment; but they rarely occasion pain. These symptoms are often erroneously referred to other diseases. Such growths usually result from catarrhal inflammations of the surfaces on which subsequently they become developed. Croup and measles are sometimes productive of them. When quite large, or very movable, their presence may be suspected by the character of the breathing. As a rule, however, they are only discoverable by observing their image in a little mirror held in the mouth. They usually require removal by some variety of surgical procedure, internal remedies being adequate for their absorption only in exceptional instances.

CHAPTER XII.

PARALYSIS OF THE THROAT.

PARALYSIS of the throat occurs in various forms as the result of disease or injury. Paralysis of the palate is recognized by its relaxed condition and the sluggishness with which it contracts on touching it with some foreign body, as the finger or a lead-pencil. In some cases it does not contract at all. This form of paralysis sometimes follows diphtheria, but occurs in many other diseases likewise. There is a nasal twang to the voice, and great difficulty in swallowing fluids, portions of which escape into the upper part of the pharynx, and thence run out by the nasal passages.

Paralysis of the pharynx is indicated by difficulty in swallowing, or even inability to swallow. The muscles of the pharynx fail to contract on contact of foreign substances. This form of disease is sometimes a manifestation of hysteria, as indeed is, sometimes, paralysis of any other portion of the throat, or indeed of any other portion of the body.

As will be explained in the article on voice, there

are two vocal bands at the top of the windpipe which are held asunder during ordinary respiration, and which are brought together during phonation or use of the voice. Now, some or all of the muscles by means of which these vocal cords are brought into apposition, may become paralyzed, in which case there will be more or less hoarseness, or even absolute loss of voice, according to the nature and degree of the paralysis. Again, the muscles which separate the vocal cords in breathing may become paralyzed, and then there will be no loss of voice, nor even hoarseness in most cases, but there will be great difficulty in getting the air to enter the air-passages, the symptoms being much like those mentioned under the head of croup.

The management of these various forms of paralysis requires treatment of the malady or injury by which they may be occasioned, and, very often, appropriate treatment by electricity, under the care of a competent physician. Paralysis preventing swallowing may require the introduction of a stomach-tube in order to feed the individual by the mouth; or the use of nutritive enemas to feed him by the bowel. Paralysis preventing due inspiration of air may require an artificial opening in the windpipe, below the seat of the disease, and the permanent use of a tube to keep the artificial orifice open until the paralysis is overcome, if it be at all remediable.

CHAPTER XIII.

SPASM OF THE THROAT.

INVOLUNTARY contractions of the muscles of the throat sometimes occur, and are occasionally very serious, even to such a degree as to imperil existence. Thus, when the contractions take place in the muscles at the top of the windpipe, air cannot get through it into the lungs, and the individual necessarily suffocates, if the spasm does not relax in one or two minutes. Usually, however, the accumulation of carbonic acid in the blood, as a result of the spasm, produces a peculiar relaxing effect, due to carbonic acid gas poisoning, and, as the muscles relax, the air rushes into the air-passages with a stridulous noise, the blood becomes oxygenated again, and this oxygenation, in its turn, overcomes the threatened poisoning by carbonic acid gas. This is the condition which exists in the affection known as *spasmodic croup*.

SPASMODIC CROUP is a term long used, though improperly, to designate a peculiar disease to which children are subject during the first few years of

life, though it occasionally occurs at a later period also. There is a sudden spasmodic closure of the vocal bands at the top of the windpipe, between which the air passes uninterruptedly in ordinary breathing. This interferes with inspiration, and the forced effort to inhale the air produces a characteristic noise (vocal stridor) as it passes the very narrow chink between the vocal bands. This sound is almost identical with that which occurs in some cases of true croup, or of whooping-cough, or when some local irritant has got into the windpipe, or the tube leading to it. On account of the similarity of this sound to that produced in forced inspiration in croup, the disease has been termed "false croup," "spasmodic croup," and so on. But it is not croup, for there is no inflammation, and no development of a morbid product to interfere with the breathing. It is a spasm, owing to disease of the nerves of the parts, usually due to indirect or reflected influence from irritation in the mouth, stomach, intestinal canal, spinal column, and so on. It occurs during teething, indigestion, and other conditions, and is much more frequent in scrofulous or rickety children than in others. Sometimes there is only one paroxysm, such as has been described, coming on suddenly, and usually at night. Sometimes there are several, at periods of a few hours, days, weeks, or even months. In the intervals, the child is apparently well. There is danger of death from suf-

focation during any of these paroxysms, but this occurrence is not very frequent.

If a child should be suddenly roused from sleep with great difficulty of getting breath, cold water should be dashed upon the face and chest, its body be exposed to the cool air, and the surface slapped to excite respiration by reflex action to "bring it to," as it is called. Hartshorn, if at hand, or strong water of ammonia may be held near, but not too near, to the nose. A good plan is to dip a couple of fingers in the fluid and move them about at a distance of half an inch or so from the nostrils. If the spasm does not relax almost immediately, the forefinger should be passed down the child's throat, to try to force an entrance into the air-passage, or to pass beyond any obstruction which may be felt. This is usually all that there is time or opportunity for doing during a first paroxysm. Warm water should be kept at hand in apprehension of subsequent paroxysms, so as to place the body of the child in a warm bath while the neck and face are being bathed with cold water. Meanwhile the services of the physician should be solicited for advice as to the general treatment of the case, and the proper method to be pursued in case of a repetition of the spasm.

Spasmodic Cough, due to uncontrollable approximation and separation of the vocal cords, sometimes occurs, usually in excitable and hysterical individuals,

chiefly females. It has been likened to St. Vitus's dance, as that disease affects the limbs, and certainly accompanies a few cases of that affection. The cough is characterized by frequent repetitions of some peculiar sound, incessant almost, for the time being, and imitative of the cry of some of the lower animals; that of the yelp of a little dog being by far the most frequent sound. Sometimes it is like the quack of a duck, and so on. The sound is sometimes repeated as often as every second, during a minute or two, to be resumed after a brief pause of five or more minutes. Any excitement usually brings on the cough. It does not cease even during meals, in some cases. It does not occur during sleep. The affection is often of long continuance, even for months or years, and is sometimes very distressing. It is not commonly due to any disease in the throat or windpipe itself, but usually to some irritation elsewhere. It is essential, therefore, in the treatment of this affection, that the individual submit to whatever treatment the physician considers appropriate to restore the equilibrium of general health, even though the organ treated be far away from the throat, and without any direct connection with it. Electricity suitably applied, so as to subdue the irritability of the great nerves that course along the neck, will often promptly control the cough; but the cure is not apt to be permanent unless the cause of the reflex irritation be removed.

Ear Cough.—A variety of spasmodic cough is actually due to irritation in the ear, probably conveyed along a nerve that runs on the inside of the drum membrane of the ear. It is less intense than the spasmodic cough just described, and can be excited by placing the finger or some other object in the ear.

It is to be cured by treatment directed to the ear, and not to the throat.

Spasm of the Pharynx, or entrance into the gullet, sometimes occurs, especially in hysterical subjects. Here there is an inability to swallow, the sensation being as though there were some mechanical obstruction to the passage of the food. There is great fear, in the mind of the individual, lest food and drink should go the wrong way, *i. e.* into the air-passages, and produce suffocation. Sometimes there is a spasm of the palate, too, with more or less constant uneasy sensations in the parts.

These cases require the judicious management of a competent medical attendant.

CHAPTER XIV.

NEURALGIA OF THE THROAT.

NEURALGIAS, or pains along the course of the nerves, occur in different portions of the throat, as they do elsewhere. The absence of evidences of serious disease, on the one hand, or the presence of tumors and the like pressing on the course of a nerve, on the other, indicate the true nature of the complaint, which is to be treated by the means usual in the treatment of neuralgias generally. It is quite possible, as in spasm, that the malady is often of reflex origin from disease in some distant part of the body; and in such instances the neuralgia will not be likely to subside permanently until that organ recovers, whether it does so spontaneously, as is sometimes the case, or as the result of intelligent treatment, as is more frequent.

These neuralgias are not to be confounded with the pains incidental to inflammatory and other affections of the throat, of which they are symptomatic accessories.

CHAPTER XV.

NASO-PHARYNGEAL CATARRH.

THE upper portion of the pharynx, above the palate, the roof of the pharynx, and the posterior portions of the nasal passages are liable to become diseased together in the form of what is known as naso-pharyngeal catarrh. It is quite common as a chronic affection or disease of long standing, and is usually the result of a succession of more or less acute attacks which have left the mucous membranes of the parts designated in a permanently swollen condition, with a disposition to excessive secretion from their mucous glands. In some cases, the glands themselves are diseased and permanently enlarged.

The symptoms are those of more or less continuous impediment to free respiration through the nose, and the accumulation of viscid phlegm or mucus in the upper part of the pharynx, and at the back part of the nasal passages. This mucus is usually hawked out of the throat by a more or less violent inspiratory effort through the nose, attended at times with more

or less gagging. Sometimes portions of the mucus, which cannot be discharged in this way, become desiccated into crusts, which decompose in the parts and give rise to fetid breath, and are discharged, at intervals of a few days, in masses of variable size, often more or less moulded to the shape of the parts from which they come. This discharge gives relief to a disagreeable sense of stuffiness in the parts, which gradually reappears as fresh masses accumulate. These masses are sometimes tinged with blood from rupture of small vessels. Sometimes these masses are swallowed, either voluntarily or unwittingly. They should always be expectorated. If taken into the stomach, they irritate that organ and the intestines, for they are insusceptible of digestion, and thus are apt to produce dyspepsia and irregular diarrhœa. There is no ulceration of the diseased tissues, except under peculiar conditions of system; a fact which it is well to bear in mind, especially if resort is had to advertising charlatans, who are often disposed to assert the existence of ulcerations to make their services appear the more valuable in case of cure at their hands. In fact, many of these practitioners state that the discharged masses of desiccated mucus are ulcers which have come away.

The chief point of treatment in this affection is to employ whatever means may be necessary to re-establish the general health or improve it, and to

cleanse the parts of these masses at regular intervals, so as to prevent their accumulation. If this cleansing is thorough and efficient, the mucous membrane, freed from the mechanical irritation of their presence and the chemical irritation of the products of their decomposition, will get well of itself. Without the cleansing, relief from treatment, local as well as constitutional, will only be temporary. Under proper management, the relief will be permanent.

There are several methods of cleansing the parts. The best material to use, in most instances, is a solution of table salt, or of chloride of sodium, one teaspoonful to the quart of tepid water at about blood heat. It is necessary to have the fluid at about the same temperature and specific gravity of the blood, in order to avoid certain injurious effects which may otherwise follow. The fluid may be snuffed up from the hand or from a cup or other vessel, or be thrown into the nasal passages from a syringe or a spray-producer, or be passed over the parts in a douche from a vessel supplied with flexible tubing and a well-fitting nozzle, applied within each nostril alternately. These washes should not be applied until their method of application is shown and explained by the physician, because of a liability that the fluid may run through the vent-hole of the drum of the ear into the drum itself, and produce serious and sometimes permanent injury. The head should be slightly bent forward,

the mouth be kept open during the process, and all movements of swallowing avoided. With fluids of proper temperature and density, these precautions will almost always secure the individual from injury, unless there is some deformity, congenital or from disease, or an unnaturally large orifice to the vent-tube of the ear-drum.

When there is an offensive odor from the retained masses of phlegm and mucus, a disinfectant should be added to the cleansing solution. These ablutions should form an essential part of the daily toilet, as much so as a resort to the tooth-brush or the wash-basin.

Cases of naso-pharyngeal catarrh kept up by the presence of foreign bodies, tumors in the nasal passages or dead bone, will not get well until after the removal of these sources of irritation.

PART II.

THE VOICE.

CHAPTER I.

VOICE.

THE VOICE is the sound generated in the larynx at the upper part of the air-passage, by the rapid vibration of the edges of two membranous bands, stretched transversely over the top of the windpipe, from before backward and slightly downward. A delicate elliptic space is left between the two vocal bands (Fig. V.); and the air from the lungs, as it escapes forcibly through this contracted passage, strikes the edges of these bands with a force which sets them vibrating. The sound started in the air-tube by this vibration is the voice. During ordinary respiration, these vocal bands are widely separated behind, so as to present a large triangular space between their edges for the uninter-

Fig. V.—Diagram of the Vocal Bands as Adjusted for Phonation, or Voice.

1. 1. Vocal Bands.

rupted and free passage of the air (Fig. VI.); and they separate a little more during a deep inspiration, and move slightly towards each other during expiration. In sounding the voice, however, as above stated, the vocal bands are brought together posteriorly to the middle line, and held there as long as the sound is being made (Fig. V.); separating again when a deep inspiration is to be made (Fig. VI.); the process being repeated as long as vocalization is continued. It is thus that the ordinary expiratory current of breathing is utilized in the normal production of the voice. A vocal sound can be produced by the inspiratory current likewise, if a special effort is made to do so, as sometimes practised by ventriloquists; but the sound is rough, coarse, and disagreeable, and the effort soon becomes tiresome and difficult.

Fig. VI.—Diagram of the Vocal Bands Separated Behind, as in Ordinary Breathing.

1. 1. Vocal Bands. 2. Free Space for the Breath.

In cases of spasmodic approximation of the vocal bands, as occurs in certain cases of false or spasmodic croup, and in a number of diseases of the upper portion of the air-passage, this unnatural vocal sound is actually produced at every forcible effort of inspiration, and constitutes a special alarming and heart-rending sound which is known as stridor.

CHAPTER II.

ACOUSTICS OF VOICE.

THE physical laws in accordance with which voice is produced are just the same as those which control the physical production of all other sounds. If, therefore, the general laws of sound (acoustics) are reviewed, and then the mechanism of those portions of the human organism concerned in the production of vocal sound is studied afterward, considerable insight will be gained as to the nature of the voice.

What is *sound?* "Something we hear," some bright little reader may mentally reply. And so it is,—something that is heard. And it is only by hearing it, that it can be comprehended. The deaf-mute has no conception of the nature of sounds. If he were standing alone by the Falls of Niagara, there would be no sound, for there would be no organ of hearing to interpret as sound the commotion in the water and in the atmosphere produced by the great cataract.

The sensation of sound is due to a certain motion or tremor produced in the molecules of the extreme

filaments of the nerve of hearing, and vibrating synchronously or in unison with the sonorous body. The motions of the sounding body are transmitted in pulses or waves through the air, or whatever other medium it may be, into our ears, and thence along the nerve of hearing into the brain, by which it is perceived and interpreted, and upon which it makes the special impression which we designate *sound.* Now, whether this motion is communicated from without, as in the ordinary sounds to which we are daily accustomed, or whether it exists primarily in the filaments of the nerve of hearing, the result, in either case, is sound. A blow upon the side of the head often shakes the auditory filaments and produces sound. A current of electricity passed through the organ of hearing likewise produces sound. There is reason to believe that the singing in the ears occasionally heard by nearly every one, and the noises of wind and water, sometimes of music, and so on, to which certain invalids are subject, are all of them the result of a physical motion or tremor set up in the auditory apparatus.

The peculiar form of motion which gives rise to the sensation of sound is that form known as oscillation or vibration ; a motion that repeats itself at regular intervals,— a motion to and fro, up and down, forward and backward,— the motion of a pendulum, of the balance-wheel of a watch, of the strokes of a

trip-hammer, of a ball kept tossing in the air, etc. The effect upon the air is to produce alternate condensation and rarefaction in spherical waves or undulations, radiating from the centre of disturbance. When this sort of motion is not excessively rapid, that is to say, when it recurs with less frequency than sixteen repetitions in the second of time, it is too sluggish to rouse the organ of hearing, and produces merely some of the ordinary manifestations of mechanic force, as we see in the industrial arts. But when it is more frequent than sixteen times per second, there is special manifestation of sound, whatever the physical work that may be going on; and the pitch, intonation, or acuteness of the sound rises in direct proportion to the increased frequency of the motion,* until, at the rate of from thirty thousand to forty thousand repetitions per second, the effect becomes so shrill and sharp as gradually to transcend human powers of hearing it; when all sound ceases, and our ears are silent to the increased motion. There is abundant evidence, however, to show that vibrations even still more rapid can be heard by insects and other animals. The physical reason that such rapid vibrations fail to impress the organ of hearing, is probably due to the fact that they are too rapid for the weight or density of the nerve-fibres to respond

* Listen to the musical whiz of a steam-saw when sawing lumber, for example.

to, and that before these fibres have time to recover, as it were, from the forward motion of one oscillation, the others come on behind with such rapidity as to keep the nerve-fibre pressed still, or dampened, as it were, so that it has no opportunity to vibrate, and is consequently silent.

Away beyond the limits of audition, among vibrations the rapidity of which we cannot realize, amounting to tens of millions per second, the special physical manifestation is perceived as electricity; and far beyond the limits of electric excitation, where the motion begins to be executed in hundred of millions of vibrations per second, the manifestation of the motion is heat; and when the frequency of vibration amounts to several hundreds of millions per second, the manifestation is light; and beyond the limits of light, the motions produce those still occult forces of decomposition and recomposition known as chemical action. Hence, chemical action, light, heat, electricity, sound, and mechanic force are all manifestations of one universal force — *motion*. As these manifestations are to a certain extent convertible one into another, we are led to the comprehension of a grand fundamental principle of science known as *the correlation of forces*.

Strike a match,— one of the most wonderful inventions of human ingenuity, by the way,— and you may demonstrate several of these points at one stroke; a trite

experiment, it is true, but striking and brilliant, both literally and intellectually. The friction — *mechanic force* — develops a rapid vibration of the air around the head of the match, producing one kind of *sound*, while the explosion produces another; *heat* is communicated to the wood of the body of the match, which becomes warm to the fingers that hold it; *light* is produced by the explosion and subsequent ignition of the match, and the wood burns; and *chemical action* results, as evinced by the cloud of phosphoric acid, and the oxidation of the hydro-carbon of the burning wood; while, furthermore, the presence of *electricity*, always generated in chemical action, might be demonstrated were an electroscope or electrometer in proper connection with the match. Here, then, we have a variety of motions excited, illustrating the entire series of forces.

Rapid vibrations (at a rate exceeding sixteen per second), then, produce a peculiar effect, which excites that special sensation which is termed sound. At this rate of sixteen vibrations per second, the sound is a low rumble, which almost admits of perception of the coalescence of the sixteen vibrations into a deep tone, as in the sound from the longest organ-pipe, exceptionally used in very large organs, which is thirty-two feet in length, and is tuned to C^2 of $16\frac{1}{2}$ vibrations per second.

The more rapid the vibrations, *the higher in pitch*

becomes the sound, until a rapidity of motion is acquired which the ear fails any longer to appreciate; this limit varying in individuals according to the sensitiveness of their hearing apparatus. When these vibrations are equal-timed,—*isochronous* (*isos*, equal; *chronos*, time), periodic or rhythmic,—the effect of the sound is pleasant, and termed *musical*. When they are irregular or unperiodic, the effect upon the ear is unpleasant and disagreeable, analogous to the optical effect from an irregularly flickering flame, and the sounds that result are termed *noisy*. Music and noise, therefore, are similar in their physical qualities; and they present points of mutual approximation, although their extremes differ greatly.

The limits of noise and of music, respectively, depend solely upon the degree of pleasurable or displeasurable sensation produced upon the hearer, and vary, therefore, in different individuals, according to the delicacy or sensitiveness of their auditory nerves.

Music, the result of rhythmic or equal-timed vibrations, is audible at greater distances than noise, the result of irregular or unequal-timed vibrations. This greater reach of music is intuitively utilized in the street cries* of large cities, in the auctioneer's rattle-

* Such as those of the rag-men, venders of fish, fruit, hot-corn, etc. Philadelphians will recall the great reach of the peculiar, musical cry of *the* "hominy man."

like announcement of bids at a public sale, in calling out to persons at a distance, and the like.

Music and noise are convertible, also. Sounds which in themselves are musical, as the successive tones of the gamut rapidly produced from the piano-forte, for example, become discordantly transmuted into noise if struck together simultaneously. When this is done, the rhythmic vibrations of each string conflict in part, and thus excite irregular movements.

On the other hand, again, sounds which are simply noises as long as they remain isolated, such, for example, as sounds produced by striking a piece of wood, or a paving-stone, may be transmuted into music by striking them in series arranged to yield the tones of the gamut, as in the xylophone, or wood piano, the glass harmonicon, and similar instruments. The musical character of the tones evolved by the rammers of the street-pavers when a series of them are engaged in hammering the cobble-stones of our streets, is well known to residents of cities. It is on record that a series of animals have been utilized as musical instruments. Thus, we read that at Brussels, in 1549, during a celebration in honor of a miraculous image of the Virgin, a bear performed upon an organ of cats. This organ was composed of twenty live cats—with cries giving consecutively the tones of the gamut—confined separately in narrow boxes, over which their

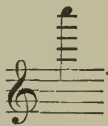
tails passed ; these appendages being secured to cords which were fastened to the registers of the organ, and corresponding to the keys of the instrument. Each time that the bear struck his paw upon a key, he thereby pulled on the tail of one of the unfortunate prisoners, and thus forced the series to miau through the whole gamut. Conrad van der Rosen, the jester of the Emperor Sigismond, is said to have succeeded in curing his master of a black melancholy, by executing melodies upon an organ of cats, ranged in gamuts, whose tails he pinched in striking the keys. As sententiously observed by Radau, from whose volume on Acoustics the above anecdotes have been taken, "Cats were not happy at this epoch."

Sounds, vocal and otherwise, differ in three important characteristics — *intensity*, *pitch*, and *quality*. Attention may be called, in addition, to a subdivision of quality, especially as regards the voice,—*reach* or penetrant power over distances.

Intensity means loudness, and is independent of pitch or quality. Pitch is the degree of acuteness or gravity, the intonation, or the position of the sound in the musical scale, and is independent of intensity or quality. Quality (*timbre*, tone-character) is that peculiarity by which the sound of any one instrument or one voice is distinguished from other instruments or other voices, and is independent of intensity or pitch.

INTENSITY.— Intensity is due to the extent of the vibration to and fro, consequently to the size of the sound-waves or undulations, set up in the atmosphere. Now, bodies vibrating in larger excursion to and fro from their point of rest, set larger masses of air in motion than when that excursion is more limited; and the greater the extent to which the disturbance in the air — really a condensation and rarefaction — reaches, the louder the sound. If we pull lightly upon the cord of a piano, it will vibrate but a short distance to and fro, and the sound will be feeble; but if we pull it more forcibly, it will move over a greater space, and the sound will be louder because a greater mass of air is set in motion, and larger waves of sound generated in consequence. The same thing takes place in the human voice. If the vocal cords (as they are unfortunately called, for they are not cords but bands) are only moderately tense, they can move over a larger extent of space than when they are held more tense. Hence the sound is louder, and the sound-waves being larger, they are felt, in certain portions of the scale, as they strike the walls of the windpipe, bronchial tubes, and air-cells of the lungs,— for sound-waves travel spherically in every direction from the point of disturbance — producing that peculiar vibration of the chest-walls which has given rise to the denomination of chest-tones in the lower portion of the vocal register. The intensity

of the voice depends upon the force of impact of the escaping current of air, and upon the elasticity of the vocal bands.

PITCH.—The range of sound of which the human voice is capable — its compass — consists in round numbers of from two and a half to three octaves; less than that in most voices, more in some rare instances; the entire range, taking male and female voices together, being about five octaves. The extreme limits of human voice observed, however, are said to be the F^1 of $43\frac{1}{2}$ vibrations per second, in the voice of Fisher, , and the c^6 of 2100 vibrations in the voice of La Bastardella,  . Now, for the production of every note in the register of a voice, there is but a short pipe, the windpipe, the length of which, by the elevation of the larynx as the sounds rise in pitch, can be so slightly varied as to count for little in the mechanism, and a pair of elastic membranous bands (*reeds*, *tongues*, *vocal cords*), each less than an inch long and less than a quarter of an inch broad, and with but one free surface or edge. The modification of pitch is chiefly effected by progressive variations in the tension of the membranous vocal

bands, and by slight variations in the shape of the elliptic fissure between them; a number of complex muscular actions being concerned in bringing this about. This is supplemented by variations in the position and shape of the walls of the larynx and windpipe, pharynx and mouth; but to what extent, or in what manner, is as yet undetermined. The force of the current of air will likewise affect the pitch to a certain extent, as in wind instruments generally.

It is known that if a violin string or a drum-head be stretched, so that its tension is increased, the sound it will yield when struck will be higher in the scale the greater the tension; while the pitch falls as the string or membrane is slackened, because its tension is being decreased. So it is with the human voice. When the laryngeal muscles stretch the vocal cords, increasing their tension, the pitch ascends; and when the muscles are relaxed so that the tension is diminished, the pitch falls. It is likewise known that if a string or membrane is slackened too much, it will not vibrate at all, and will yield no sound; and if stretched too much, it will be ruptured and become incapable of vibrating until readjusted or repaired. Mere stretching of the vocal bands, being practicable only within moderate limits, will only increase the pitch to a certain extent; and for the further extension of the register, another action of the muscles is requisite, which progressively shortens the free surfaces of the cords

at the same time that they are rendered tense. If we examine the strings yielding the higher tones of a piano, we see that they are shorter and shorter as these tones rise in the scale; and we know that if the length of a string on the violin is practically shortened by placing a finger on it, *stopping it*, its tone rises in pitch, and that the shorter the string the acuter is the sound. Thus it is apparent that the processes in the human organ, stretching and shortening of the vocal bands, are the same physically as those employed in artificial musical instruments for raising the pitch. The pitch of a sound, as has been said, depends on the number of vibrations that the generator of the sound sets up in the air in a given time — the greater the number of vibrations per second, the higher the pitch; and it is evident, on a moment's thought, that the shorter anything is, the more rapidly it can be moved, and that the tenser it is the more rapidly it can be moved. The physical laws that preside over the production of the human voice do not differ in any particular from the physical laws governing the production of sound from any other source.

Quality.—It is a point of universal observation that of several notes of the same pitch and of equal intensity, one may be distinguished as coming from a harp, another from a violin, a third from a flute, a fourth from a human voice, and so on. A musical ear will distinguish one flute from another, one violin

from another, one voice from another. Nay, more; it will distinguish the peculiarity of different performers of equal skill upon the same identical instrument, the peculiar ring of the same voice as it is at its best or otherwise. This difference is quality, or *timbre*. It is that characteristic by means of which we distinguish the voices of our friends, whom we can thus recognize in the dark, or under a change of feature, or of dress after long separation. The physical cause of quality is difficult of comprehension. It has so important a bearing upon the cultivation of the voice, that an attempt must be made to explain it, even in a little popular volume like this. The quality of a tone depends, physically, upon the shape or composite conformation of the series of undulatory waves of sound which collectively produce it. Variation in the shapes of sound-waves of like pitch and intensity, or of varying pitch and intensity too, for that matter, depends upon the fact that all sounds are composite. Indeed, they are susceptible of being analyzed experimentally into their component factors, by shutting off the appreciation of portions of the series, on a principle analagous to that by which a ray of white light may be decomposed into the prismatic colors of the spectrum.

In any sound, as that from one note on the piano or violin, there is a fundamental or ground-tone, which determines the pitch,— that tone which strikes

our attention prominently. If we listen attentively, however, knowing beforehand what we are to try to detect, we find, commingling with it, other and feebler sounds which are higher in pitch,* and which bear to it certain simple relations of harmony. † Where the harmony of these additional tones — "upper-tones" or "over-tones," as they are termed — is perfect, the effect is very agreeable; and where there is an element of discord, the sound is less pleasant. If we listen to the striking of a bell, such as is used in a town-clock, for example, we shall be able to detect some of these sounds, especially as the ground-tone of the bell is fading.‡ But they exist in all other sounds likewise. They may readily be detected in the graver tones of the piano. It is the relations which these over-tones bear to the fundamental tones, different in different instruments and voices, and dependent in great measure on the shape and character of the instrument and vocal apparatus,

* Some are lower, also, and the two sets produce new combinations of summation-tones and difference-tones; but these are not alluded to in the text, for fear of rendering the elucidation too complex for most of the readers of a scientific primer.

† These comprise the octave above, the 5th of that octave, the second octave, the major 3d of that octave, etc., being due to vibrations of 2, 3, 4, 5, etc., times as many as the fundamental tone.

‡ A globe such as is placed over a gas-jet gives the same results when struck.

which decide the timbre. Each over-tone makes its own impress on the air, as well as the fundamental tone does; and the *shape* or form of the vibration is made up of the combined effect. Take these over-tones away from the fundamental tone, or conceal them, as can be done by certain experiments, and the fundamental tone of every instrument has exactly the same quality. These over-tones are less prominent in large open organ-pipes than in any other instruments of music; and that is the reason why their sounds are dull and unsatisfactory to the ear.* The organ-builder is aware of the fact that the sounds of large organ-pipes are unsatisfactory, though he may not be aware of the reason; and he has found out empirically — by experimental investigation — that the defect can be remedied by adding a series of pipes of higher pitch, giving the harmonics, as they are termed. And these additional pipes are so arranged that they are all opened simultaneously with the fundamental pipe, so that they all sound together and enrich and reinforce the dull or pitch pipe. This arrangement is called a furniture. In fact, it furnishes the very upper-tones which are deficient in the tone of the large pipe; and when the entire series are sounded together, the combined *quality* satisfies the ear.

* An idea of what is meant can be obtained by blowing over a bottle. The over-tones are weak, and the pitch appears graver than it really is.

Quality or timbre, then, results from the harmonious commixture of a fundamental or ground-tone and its over-tones and their combinations. The delicacy or shade of the clang of the tone varies with the number of these over-tones, their position in the musical scale, and their relative intensity as maintained during the continuance of the tone. The clang is an accord, a sort of orchestral combination in miniature.

The ground-tone of a tuning-fork, as the easiest example to be cited, may be isolated from its over-tones by causing it to vibrate over a rather wide bottle, resonance-tube, or box, the deepest tone of which corresponds in pitch to that of the fork. As the higher tones of the fork differ from the higher tones of the resonance tube, the ground-tone alone becomes intensified, and the over-tones of both are unheard. The mixture of the two ground-tones then results in a simple tone, to all intents and purposes.

With this explanation, it is hoped that the reader can understand that any influence which interferes with the precision with which *both vocal bands* should be adjusted, in equal strain and tension, will disturb the harmony of the fundamental and upper-tones of either band, or both of them, and thus impair the quality of the voice. This precision of equable adjustment is really greater in a well-trained voice than that acquired in playing upon any artificial instrument

of music, and is the main reason of the superiority of execution acquired by a skilled vocalist over that of an instrumental performer. The automatic control of adjustment attained by Madame Mara, whose voice had a compass of three octaves, is said to have been such that she could effect as many as twenty-one hundred changes in pitch, 100 between each two notes of the 21 in her compass. The ordinary capacity of a voice in good culture is stated to be equal to about one hundred and fifty changes, ten or more for each tone of a compass of two octaves, or a little beyond. As each change in the tension of the vocal bands would not vary their length more than the one-fifteen-hundredth part of an inch, we can faintly estimate the extreme delicacy of adjustment of tension of which the muscular apparatus of the vocal organ is susceptible; a delicacy greatly in excess of that acquired in the trained fingers of the most skilled workman. In Madame Mara's case, the variations of tension between the tones that she could produce would represent a successive lengthening and shortening of the vibrating edges of her vocal bands in successive proportions of one-seventeen-thousandth of an inch,—a marvellous and almost inconceivable delicacy of precision of touch.

The capabilities of well-cultivated phenomenal voices are almost incredible. Thus, among a number of instances alluded to by Mrs. Seiler in her excellent

manual on "The Voice in Singing," it is related of Farinelli, among other things, that "on one occasion he competed with a trumpeter, who accompanied him in an aria. After both had several times dwelt on notes in which each sought to excel the other in power and duration, they prolonged a note with a double trill in thirds, which they continued until both seemed to be exhausted. At last the trumpeter gave up, entirely out of breath; while Farinelli, without taking breath, prolonged the note with renewed volume of sound, trilling, and ending, finally, with the most difficult of roulades."

REACH is the penetrant power of a sound over distance and obstacles, such as other sounds, and is due to the purity of the tone, which, in its turn, is dependent on the accuracy with which it is produced. It is well known that at the great musical Peace Jubilee at Boston, in 1869, the pure tones of the voice of Madame Parepa-Rosa were distinguishable above the accompaniment of a chorus numbering nearly twelve thousand voices, and an orchestra of more than one thousand instruments; and this with audiences estimated at over 40,000 people. A voice, the tones of which are accurately poised, will travel a great distance, independently of its intensity or loudness; and this accounts for the remarkable facility with which some people are heard, even with relatively feeble voices.

The quality of the voice, due, as we have seen (page 104), to the harmonious relation between the fundamental tone of the vocal bands and its upper-tones or harmonics, is largely dependent upon the resonance of the cavities of the throat, mouth and nose, through which the expiratory current of air passes out, and the waves of sound likewise, after the vocal bands have been set into vibration. The vocal bands are the generators of tone; but if the waves set up were not reinforced by the cavities above, the sound would be much like that of the reeds of mechanical toys. This is observed in individuals who have cut their throats in such a manner as to expose the vocal bands to direct inspection. The air, and the sound-waves escaping by the wound in these cases, have not that peculiar resonance imparted to them which they received when they passed through the natural passages; and thus the peculiar or familiar vocal sound is not produced. When the tonsils are enlarged, as in quinsy, for example, this peculiar resonance is impaired, and the voice acquires a characteristic dull and disagreeable *timbre* or quality, which disappears when the parts resume their normal dimensions. So, too, when the nasal passages are occluded; whether by design, accident, or disease. The influence of loss of teeth on the quality of the voice is well known, and the change is easily apparent when a set of false teeth is removed from the mouth, or used for the first time.

It may be mentioned, here, that the prejudice, existing to a certain extent among vocalists, against removing the exuberant portions of chronically enlarged tonsils, for fear of impairing the voice, is a chimerical one; the fact being the reverse. Clipping off the excess of a permanently elongated uvula, likewise, far from injuring the voice, occasionally improves it, though there is usually no effect noticeable. The irritation excited by leaving it unclipped, on the other hand, may impair the voice considerably.

When the cavity resounds to the fundamental note of the vocal bands, or to one of its higher harmonics or over-tones, the sound is reinforced in a peculiar manner. The interior of the throat, mouth, and nose is to the vocal bands what the case of the violin is to its strings, the sounding-board of the piano to its strings, the body of a reed instrument to the reed, and so on. The sounds of the strings and reeds in unison with the sound yielded by striking the case, sounding-board, or pipe, or in unison with their overtones, are those most strongly reinforced. So, too, with the voice. The sounds of the vocal bands in accord with the sound proper to the shape of the resonant cavity of mouth and throat at the moment are those which are most reinforced; and as the proper sound of the resonant cavity of the voice varies with its shape, so, for the time being, the sounds vary which it can reinforce at the moment. If a series of fillips

are given to the cheek with the finger, while the mouth is opened wider and wider, a different pitch will be given to each sound produced. The trick of imitating the flow of liquid from a bottle in this manner is a familiar instance. The pitch at any given moment of the experiment is the pitch of sound of the vocal bands which will be most reinforced by that position of the mouth. The motions of the mouth, tongue, palate, and throat vary the shape of the cavity, and its capacity of resonance, for different portions of the scale. This fact explains the impossibility of making certain sounds of certain pitch, unless the mouth and its contents are maintained in a suitable position attuned to that pitch.

The influence of the pitch of a sound in exciting a silent instrument attuned to the same pitch is well known to musicians. The response of a glass gas-globe to certain tones of the voice, for example, or the rattling of a pane of glass from a similar cause, must be familiar to all. The waves of sound set up in the first instance are powerful enough to start the vibration of the responding body. The effect is mechanical altogether. It is similar to the effect of rhythmic vibration of a suspended bridge which may accumulate force enough to throw it down. Hence marching in time is prohibited upon suspension bridges. There is an old saying that a bridge of this kind could be destroyed by continuous fiddling on a note of the same

pitch as that of the bridge, from mere accumulation of force in the sonorous waves. Heavy bells are started by commencing with gentle impulses in rhythmic accord with the proper oscillation of the bell. To quote from an excellent novel (Middlemarch, Chap. XXX.):

> "How will you know the pitch of that great bell
> Too large for you to stir? Let but a flute
> Play 'neath the fine-mixed metal! Listen close
> Till the right note flows forth, a silvery rill:
> Then shall the huge bell tremble — then the mass
> With myriad waves concurrent shall respond
> In low, soft unison."

The shape of the resonant apparatus (cavities of the throat, mouth, and nasal passages), therefore, has great influence on the quality of the voice. Alterations of configuration by disease impair the voice, and alterations of shape by design modify it. The peculiar vowel sounds of spoken language are found to be due to the shape given to the resonant cavity in their emission. Thus, with the mouth wide open, the only sound that can be made by the vocal bands alone, is the vowel sound *ah* (or *a*, as in f*a*ther); and as the mouth is gradually closed up more and more in front, it becomes possible to make the vowel sounds e (or *a*, as in h*a*te), i (or *e*, as in m*e*te), o, u or oo, and the compound vowel sounds nearest to each pure vowel sound respectively. There are also modifica-

tions in the position of the tongue and of the soft palate which favor the emission of these sounds; but it is beyond the purpose of this little volume to do more than call attention to the fact that the difference between the vowel sounds of a language is chiefly one of quality or timbre, the vocal bands or factors being merely the exciters of the sounds. A few experiments before a looking-glass, with the finger in the mouth, upon the tongue, or against the palate, will teach any one the positions assumed by the tongue, palate, and lips in the production of these sounds; and the change made in the character of the vowel by altering the shape of the mouth while sustaining any sound made by the vocal bands, is readily detected. The differences between the vowel sounds of different languages, or of the same language as spoken in different localities (dialects), are due to the difference impressed on the shape of the resonant cavity, chiefly of the mouth; and the habit of producing vowels in a certain manner is so strong that adults, even with correct ears for musical intonation, are unable to screw their mouths up, so to speak, in such a manner as to produce the vowel sounds of a foreign language accurately; hence, the broken English of foreigners, or the permanence of foreign accent. Children, on the other hand, whose organs are flexible, and have not become too much habituated to the special accents of their mother-tongue, acquire

greater facility in a foreign language, so that, often, very little of their original accent is apparent in speaking the newly-acquired language. The children of foreigners in this country, who habitually speak the language of their parents in their homes, rarely acquire an English accent absolutely free from foreign tinge.

So important is it deemed by some teachers of vocal art, that proper positions of the mouth should be maintained for certain sounds, that they actually make their pupils practise before a mirror until they become expert, or have learned to break themselves of adopting awkward positions of the mouth and its contents, which impair the purity of the tone, or attract attention as contortions or actual deformities.

It is thus evident that the human vocal apparatus — lungs, windpipe, larynx, mouth, throat, and nose—is a musical instrument, capable of rendering shades of expression far more delicate than any that can emanate from a musical instrument "the work of men's hands." It is emphatically a reed instrument, with bellows (lungs), pipe (windpipe), reed-box (larynx), two flexible reeds (vocal bands), and resonance attachment (throat, mouth, nose). These parts are movable upon themselves and their adjacent structures; and are kept moist and flexible by a bland lubricating fluid continuously secreted from the glands of the delicate mucous membrane which covers and protects them.

CHAPTER III.

VARIETIES OF VOICE.

FOUR chief varieties of voice are recognized in vocal music or utterance;—two in the voice of the male, and two in that of the female. These are the bass and tenor, and the contralto and soprano respectively. The peculiarity depends in part upon the natural pitch of the voice, and to a much greater degree upon its timbre or quality. The bass voice descends lower in the scale than the tenor, and its strength and beauty are resident in the graver notes; still, some bass singers can ascend as high as the tenor, though not with equal richness and delicacy, for the peculiar power of the tenor voice resides in the higher notes. In like manner, the contralto, whose superiority is manifested in the lower notes, may ascend as high as the soprano, but without the melody of the soprano, whose forte is in the higher notes. A baritone voice is a tenor voice possessing but a moderate compass in the higher scale, and yet incapable of going very low; and a mezzo-soprano is a soprano voice in the same relative condition.

There are other varieties of voice named by professional vocalists, but they are not of scientific interest, and are mere modifications of bass, tenor, contralto, and soprano.

In singing from the same score, the male voice will be pitched one octave below the female voice. In exceptional instances, however, the female voice can be pitched at the compass of the male, and the effect is the peculiar tenor-like quality with which we are sometimes regaled by these phenomenal vocalists.

The physical cause of this difference in the tone-character of the male and female voice, or of the two varieties in either sex, is not understood. Mere size of the larynx does not account for it, inasmuch as a small male larynx does not furnish the soprano or contralto quality, nor a large female larynx produce a tenor or bass voice. The voices of young boys, before puberty approaches, approximate the character of female voices; and formerly the best teachers for the female voice were those males in whom the feminine character of voice used to be artificially preserved for church purposes by a cruel operation, now happily abandoned. The difference between male and female voice may be in part due to differences in quality; in its turn physically due to the effect on the form of the sound-waves from the shape of the larynx as a resonator, above the vocal bands, and the shape of the windpipe and thorax as a reso-

nator below them. The outline of the larynx, in front, is rounded in the female, and more pointed or angular in the male, as is easily determined by feeling the Adam's apple, as it is called, in the neck. The outline of the windpipe, too, is more spherical in the female, and more hemispherical in the male (see page 17). The outline of the chest in respiration, and of course during vocalization, is different in the two sexes,— the chest of the male expanding to a greater extent low down, and that of the female to a greater extent higher up. These differences in the shape of the tubes and resonators must make their impress upon the composite form of the sound-wave (see page 101), and thus modify the quality of the sound.

Various unaccepted theories have been propounded to account physically for the possession of bass or tenor voice in the one sex, and of contralto or soprano in the other. The difference cannot be attributed to the general contour of the larynx, nor to the actual or relative size of the vocal bands. All tall individuals are not bassos and contraltos, nor all short ones tenors and sopranos; and the compass of voice is not in absolute correspondence with the actual magnitude of the vocal apparatus, nor its relative proportion to the stature or figure of the individual.

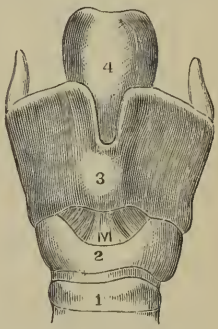
CHAPTER IV.

THE VOCAL ORGAN.

THE vocal organ is contained in the *larynx* (*larunx*, top of the windpipe), an irregular prismatic or trianguloid funnel-shaped expansion of the air-passage, on top of the tubular windpipe (trachea), and continuous with it (Fig. VII.). The angular portion of the larynx (Fig. VII., 3) is firm and resistant, and presents forward in the central portion of the neck, where it can be readily felt beneath the skin, forming the projection popularly known as the *Adam's apple*. This projection forms an acuter angle in the male than in the female. The broad portion of the larynx is firm below and flexible above, and presents backward; being more or less in contact with the posterior wall of the pharynx or entrance into the gullet, except during the passage of materials that are being swallowed. The outer wall of the prismatic larynx on each side is composed of a wing of broad, flat, and irregular-shaped cartilage, the *thyroid* (*thureos*, a shield) cartilage, which shelters the delicate and movable structures within, and protects them from undue external injury. The

larynx being part of the air-passage, there would be constant danger of food falling into it on its way to the gullet behind, were it not for a leaf-shaped valve of cartilage, the *epiglottis* [*epi*, upon, and *glottis*, the mouth-piece of a flute], (Figs. VII. and VIII., 4), which reaches over the top of it from behind the base of the tongue; being attached at its root to the inner and upper part of the angle of junction formed by the two wings of the thyroid cartilage. This valve becomes pressed down over the opening into the larynx during the act of swallowing, and thus closes it hermetically for the moment. The lower portion of the thyroid cartilage (Fig. VIII., 3), on each side, is continued into a pair of prolongations or processes which grasp either side of a stout, ring-shaped cartilage, the base of the entire larynx, continuous with the uppermost portion of the windpipe. This ring-shaped cartilage,

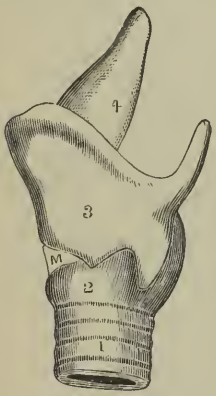
Fig. VII. — A Front View of the Exterior of the Cartilages of the Female Human Larynx.



1. Upper Ring of the Windpipe. 2. Cricoid, or Ring-like Cartilage, the Base of the Larynx. 3. Thyroid, or Shield-like Cartilage. (The figure 3 is on the Adam's apple.) 4. Epiglottis. M. A Membrane uniting the Cricoid and the Thyroid Cartilages.

the *cricoid* [*krikos*, a ring, and *eidos*, form] (Figs. VII. and VIII., 2), is very broad behind, and quite narrow in front, much like a seal-ring, — whence its name. The narrow portion in front is just below the angular portion of the thyroid cartilage, with which it is continuous by the interposition of a membrane (Figs. VII. and VIII., M), *crico-thyroid* membrane, which is easily detected under the skin, a little below the Adam's apple, and which is felt to vibrate as the voice is sounded. The firm and resistant outline of the cricoid cartilage can easily be felt below this membrane; and immediately below this again are the less resistant rings of the windpipe. The broad, posterior portion of the cricoid cartilage is symmetric, and on each side of the middle line bears a place of support for a small prismatic cartilage, the *arytenoid* [*arutaina*, a ladle (or beak of a pitcher), and *eidos*, shape] cartilage (Fig. IX., 6), quite movable on the

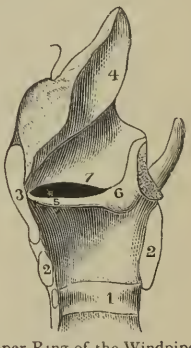
Fig. VIII. — Side View of the Exterior of the Cartilages of the Human Larynx.



1. Windpipe. 2. Cricoid Cartilage. 3. Thyroid Cartilage. 4. Epiglottis. M. Membrane uniting Cricoid and Thyroid Cartilages.

cricoid cartilage, and carrying a sharp projection or process anteriorly, to which the posterior and movable end of the vocal band (Fig. IX., 5) is attached; the anterior and fixed end of each vocal band being in close contact in front, in the angular groove formed by the junction of the two wings of the thyroid cartilage, a little below the point where the root of the epiglottis (Fig. IX., 4) (see page 117) is attached, and a little above the upper border of the crico-thyroid membrane. The two vocal bands are the sound-producers, or generators of the voice; but they are not *cords*, as their common name, *vocal cords*, would imply to the uninstructed. They are narrow bands of firm, fibrous material. If we compare the movable arytenoid cartilages, to which the vocal bands are attached posteriorly, to the rings of the handle of a pair of scissors, the angle of the thyroid cartilage to the pivot which unites the two halves of the pair of scissors, and the

Fig. IX. — Interior View of Right Half of the Human Larynx.



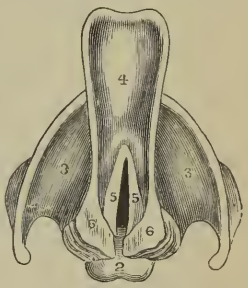
1. Upper Ring of the Windpipe. 2. 2. Cricoid Cartilage. 3. Thyroid Cartilage. 4. Epiglottis. 5. Vocal Band (Vocal Cord). 6. Arytenoid Cartilage. 7. Ventricular Band (so-called False Vocal Cord).

vocal bands to the shanks of the handle, we shall obtain a fairly approximative idea of the relative positions of these parts and of the chief, to and fro, motions to which the vocal bands are subjected. The handles of the scissors being separated, there is a wide space between the shanks, which represents the shape of the breathing space between the two vocal bands during ordinary respiration. The handles of the scissors being brought in contact, there remains but an elliptic space between the shanks, which represents the shape of the space through which the air streams during phonation or use of the voice ; the vocal bands on each side being set in vibration by the escaping current of air, just like the tongues or reeds of the accordeon or the mouth-organ, during performances on those instruments.

There is a membranous expansion reaching from each side of the lower portion of the epiglottis, in front, to the arytenoid cartilage behind on each side respectively, and there is a musculo-membranous expansion between the two arytenoid cartilages. Thus, the epiglottis in front, the two folds of membrane, *aryteno-epiglottic folds*, at the side, and the two arytenoid cartilages and their intermediate fold, *inter-arytenoid fold*, behind, form the upper boundary of the somewhat triangular-shaped entrance into the interior of the larynx. These structures are continuous below with the cricoid cartilage, itself continuous with

the windpipe, a rigid tube always open to the passage of air, and dividing and subdividing below into numerous smaller and smaller tubes which eventually reach to the air-cells of the lungs, and through which the latter are inflated in inspiration and partially emptied in expiration; for after air once gains access to the lungs at birth, these organs are never more than partially emptied. The whole structure is supported in position by attachments to the base of the tongue, the tongue-bone, and the side walls of the throat.

Fig. X.—Bird's-Eye View of the Interior of the Human Larynx, as seen from above.



2. Cricoid Cartilage. 3. 3. Thyroid Cartilage. 4. Epiglottis. 5. 5. Vocal Bands. 6. 6. Arytenoid Cartilages.

Thus the vocal apparatus is a wind and reed apparatus, the wind being forced from the lungs along the bronchial tubes into the windpipe, where it is condensed to a certain extent against the lower surfaces of the approximated pair of vocal bands, which it sets into phonal vibration as it escapes between their edges. The human vocal apparatus differs from every artificial wind and reed instrument in several particulars. The pair of lungs from which the air is driven to set the vocal bands in motion, differs from a pair of bellows not only in

configuration, but in principle. There is no valve to permit access of air after air is expelled from the nozzle of the bellows, but the air enters and leaves the lungs by the same route; and the lungs are never emptied as the bellows are, for the sides of the chest cannot be brought into contact. There is no air-chamber or reservoir to provide for a continuous flow of air in the human apparatus as in the artificial one. The reeds are flexible, elastic, membranous bands, with only a single edge, each, exposed to the current of air, and capable of vibrating.

By placing a little mirror into the back part of the open mouth (Fig. XI.), while the latter is well illuminated, we are able to see an image of the interior of the larynx (Figs. XI. and XII.), and observe in great part the mechanism of the vocal bands in the acts of respiration and of production of voice. In this way the register of the voice, as it is termed, can be studied optically, and its transition points be noted by inspection. The credit of the first successful demonstration of this kind belongs to Signor Manuel Garcia, of London, a teacher of vocal music, who, in 1854, devised the plan in the interest of vocal art. The manipulation is well known to physicians, who frequently employ it for observing the condition of the parts in disease. The art is termed laryngoscopy [from larynx, and *skopio*, I view], because chiefly employed to inspect the interior of the larynx; but it

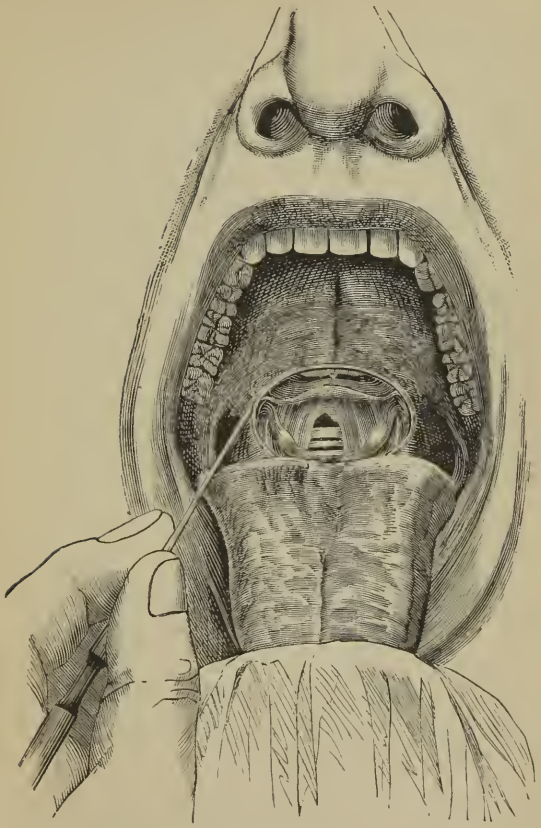
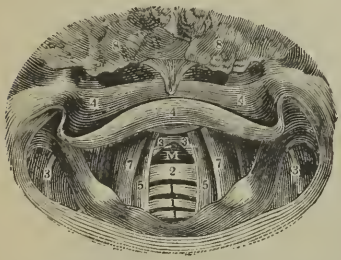


Fig. XI.—Image of Vocal Apparatus as Seen in a Mirror Held far Back in the Mouth.

reveals the image of other structures likewise, a discussion of which is foreign to the scope of this little volume.

Fig. XII.—Natural Size of Image of Vocal Apparatus, Viewed as Depicted in Fig. XI.



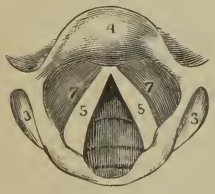
1. 1. 1. Rings of the Windpipe. 2. Cricoid Cartilage. 3. 3. 3. 3. Thyroid Cartilage. 4. 4. 4. Epiglottis. 5. 5. Vocal Bands. 7. 7. Ventricular Bands. 8. 8. Back Part of the Tongue. M. Crico-Thyroid Membrane.

The author is so firmly convinced of the importance of a knowledge of this art to all those who are really interested in the cultivation of the voice, whether for public speaking, for singing, or for conversation, that he would suggest that some little effort be made by them to acquire it. Half an hour's practice under the guidance of one already familiar with the manipulation is sufficient to learn it, and the necessary outlay for an apparatus need not exceed one dollar. It certainly stands to reason, that a teacher of elocution or of singing, who can examine a pupil's larynx or his own, ought to be able to produce better results than he could attain without such skill. A good idea of the general plan of the anatomy of the vocal apparatus can be obtained by examining the

larynx and windpipe of one of the lower animals. Any butcher will furnish these organs from a sheep or a calf at a trifling cost, perhaps merely a "Thank you." They differ in color, size, and configuration from the vocal organs of the human subject, but are sufficiently like it to enable one to recognize the different component structures which have been described. Two specimens should be obtained to be studied together; one of them to be cut open lengthwise, in the middle line in front, and the other to be divided lengthwise, in the middle line behind.

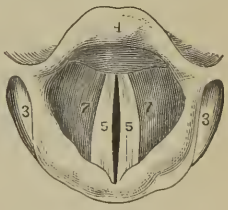
On examining the image of the larynx in the mirror, in the manner alluded to, we find that the vocal

Fig. XIII. — Image of the Larynx in Respiration. (Compare Fig. VI., p. 88.)



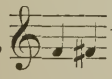
3. 3. Thyroid Cartilage. 4. Epiglottis. 5. 5. Vocal Bands. 7. 7. Ventricular Bands.

Fig. XIV. — Image of the Larynx in Phonation. (Compare Fig. V., p. 87.)



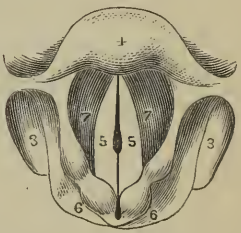
3. 3. Thyroid Cartilage. 4. Epiglottis. 5. 5. Vocal Bands. 7. 7. Ventricular Bands.

bands are widely separated during ordinary respiration (Fig. XIII.), the air passing freely and silently in

and out, there being a little increase in the dimension of the passageway during inspiration, and a return to the former size and position during expiration. When the voice is used, the two vocal bands become closely approximated posteriorly (below in the figure), with only a very narrow elliptic space between them (Fig. XIV.), through which the expiratory current of air passes, setting the free edges of the elastic and tense bands in vibration. The tones of the chest portion of the vocal register (chest register) are made by vibrations of the entire width of the vocal cords or bands, which, as the notes rise in pitch, become more tightly stretched, and somewhat more tightly pressed together at their extremities, decreasing the length of the fissure between them, and thus practically shortening the surfaces remaining free to vibrate, exhibiting the stretching and shortening already described (page 99). The tones of the falsetto portion of the register (falsetto register) are produced by vibrations of the edges of the bands simply; the mechanism of rise in pitch being the same as for the chest tones. The transition from chest to falsetto register is at F, or F♯ in the first space of the treble staff,  both in the male and in the female voice. The head portion of the register (head register), chiefly confined to female voices, is due to a close approximation, in actual contact, of the posterior portion of

the vocal bands (Fig. XV.), leaving only the anterior portion free to vibrate; the mechanism otherwise being similar to that of the falsetto register. This peculiarity in the production of the head-tones was first detected, a number of years ago, by Mrs. Emma Seiler, now of Philadelphia, while studying the mechanism of the voice as observed in the living vocalist, and was determined by her to be anatomically due to certain little needle-like prolongations of gristle (cartilage), which project into the posterior portion of each vocal band for a considerable distance, and thus render their close contact — a virtual "stopping" — practicable. The image presented during production of the head-tones had been occasionally described, but its special mechanism was not comprehended until explained by Mrs. Seiler, who had examined the vocal organs of dead females for the purpose of discovering the cause. As anatomists had been in the habit of studying the human larynx from the male subject, on account of its larger size, this point had escaped their attention; the nodules

Fig. XV.—Image of the Larynx in the Production of the so-called Head-Tones.



3. 3. Thyroid Cartilage. 4. Epiglottis. 5. 5. Vocal Bands. 6. 6. Arytenoid Cartilages. 7. 7. Ventricular Bands.

of cartilage being only rudimentally developed in the great majority of males. It is possible, therefore, by examining the image of the larynx of an individual, to pronounce as to the practicability of the production of head-tones. If the little projections in the posterior portion of the vocal bands, due to the presence of these processes of cartilage, do not exist, the voice can only be injured in useless attempts to acquire head-tones.

Similar nodules, but much smaller in size, exist at the anterior attachments of the vocal bands. These are usually larger in the larynx of the male than in that of the female.

CHAPTER V.

VOCAL CULTURE.

PRACTICALLY, all vocal sound is musical, save only the automatic-like tones emitted by the speaking deaf-mute (*mute* no longer, however). Modulation of speech is musical intonation; but the compass employed is a limited one, and the transitions slide from one tone to the next instead of proceeding by fixed intervals, as in song. The sounds of speech are chiefly concrete sounds, and the sounds of song are chiefly discrete sounds. The sounds of speech are run together, as it were, save such separation as is requisite for distinct enunciation. The sounds of song are separated from each other, save in the utterance of the consonants of words. The sounds of songs without words are altogether discrete.

The compass of voice utilized in ordinary speaking in the United States rarely extends beyond the musical interval of a fourth (C — F, half an octave, four white keys on the piano), except in localities where extremes of modulation are customary; while the compass of the ordinary singing voice may approach two octaves.

So many theories have been advanced as to the proper method of cultivating the voice, and the proper period at which its systematic cultivation should be commenced, that it is difficult to select the good and eschew the evil. Most of these theories have been evolved from the inner consciousnesses of their advocates, with little knowledge of the vocal organs, and often without any at all. The theories which carry most weight to my own mind are those advocated by Mrs. Seiler, of Philadelphia, in her excellent manuals on "The Voice in Singing" and "The Voice in Speaking;" for they are based upon accurate anatomical knowledge of the vocal organs, rare musical talent, original investigation, and extensive experience in teaching. The remarks to follow will chiefly concern the well-being of the voice from a hygienic or medical point of view, rather than an artistic one.

The voices of children are much alike in the two sexes, and remain so for a few years, sometimes comprising the entire period of childhood. The vocal organ of children is quite small, proportionately to the bulk of the body, and the pitch of the voice is high. When girls arrive at the age of twelve or thirteen, however, and boys at from fourteen to sixteen, the vocal organ begins to enlarge rapidly, so that within from one to three years it becomes nearly double its former size. During this period there is what is popularly known as a change of voice, most

marked in boys, the pitch of whose voices will fall an octave, and much less marked in girls, in whom the pitch will fall but one or two notes. At the same time the quality or timbre of the voice becomes modified, acquiring the mature clang which it retains during adult life. *During this period there should be no systematic cultivation of the voice; and children at school should be excused from participating in elocutionary or other sustained vocal exercises, without any detriment to their standing in their classes.*

There is perhaps no other period of life, except the extremes of infancy and old age, at which the voice cannot be cultivated with advantage; it being understood that very much more can be accomplished with youthful, fresh, and flexible organs than with old, misused, and rigid ones. If a child shows marked talent for singing, and its parents are desirous that the talent should be cultivated, it is not too early to begin about the fifth or sixth year of age,— provided a competent instructor is employed, who will take care of the voice and preserve it, rather than develop it. Appropriate exercises and songs for such pupils should be limited to the compass of an octave or thereabout, and should not be practised for more than twenty minutes in the twenty-four hours. This plan of treatment will preserve the flexibility of the vocal organs until such time as they are physically susceptible of undergoing the requirements of the higher culture.

Above all, the mistake must not be made that an inferior instructor will be amply sufficient until the child is older or further advanced. Far better intrust the little one to its own unaided and spontaneous efforts; for the disposition, on the part of well-meaning teachers of poor judgment, will tempt them to display the immature vocal abilities of the child to the immediate gratification of its relatives, but to the sure detriment of subsequent culture. Another point to be borne in mind by parents is this, that it is usually a mistake to intrust a female voice to a male instructor, unless that instructor is in the habit of utilizing skilled female assistants to develop the voices of female pupils. So much is left to imitation, and even to mimicry, in vocal tuition, that a pupil intuitively attempts to imitate the quality or timbre of the instructor's tone as closely as possible; and thus, under a male teacher, a female voice is insensibly robbed of some of its peculiar feminine quality. This remark is applicable, though to a more limited extent, to the cultivation of the speaking voice in elocution, as well as to the cultivation of the singing voice. Children of either sex may be safely intrusted to competent female instructors; but after the voice has changed, boys should be taught by men only.

Teaching in chorus is not calculated to develop the inherent capabilities of exceptionally good voices, though useful for other purposes pertaining to discipline. Defects are less apparent; and therefore in-

correct habits are more likely to become confirmed. Class instruction, therefore, should be supplemented by a sufficient amount of individual supervision.

For the full development of the voice and for the maintenance of any excellence that may have been acquired, systematic exercise is requisite. Control of the organs for delicate effects is soon lost, if practice is long intermitted, just the same as it is with the fingers of the skilled instrumental performer. Said Wilhelmj once, "If I neglect to practise for one day, I notice it; if for two days, my friends notice it; and if for three, the public notice it." This explains the reason why those who use their voices in public at infrequent intervals are less successful in their results, and more amenable to injury from over-effort, than those who are accustomed to frequent appearances. The actor who treads the stage nightly has a great advantage in this respect over the clergyman who enters the pulpit but one day in the week. The clergyman should practise daily for a few minutes in his study, and then he will become less susceptible to the special form of sore throat associated with intermittent labors, and to which histrionic vocalists, as a rule, are not subject. For a similar reason, the amateur elocutionist or vocalist who would attain excellence and maintain it, should keep up a moderate amount of systematic practice in the privacy of his own apartments.

CHAPTER VI.

IMPROPER USE OF THE VOICE.

IMPROPER methods of using the voice lead to certain affections of the throat, the chief one of which is popularly known as *clergyman's sore throat*, though by no means confined to members of the clerical profession. It occurs in all classes of persons who strain the voice or misuse it. It consists in a congestion of the mucous membrane and muscles of the throat, with enlargements of many of the minute glands which secrete the lubricating fluid that keeps the surface of the throat moist and pliable. These enlarged glands are visible in the form of prominent groups of projections, varying from the bulk of pin-heads to that of small peas or beans, irregularly distributed upon the surface of the mucous membrane. The mouths by which these glands discharge their lubricating material being choked up by swelling, that material becomes pent up in them and unable to escape, and thus accumulates in the glands and distends them. Now the congestion above alluded to, which is the first step in the entire process, is produced in

the following manner:—The muscles of the throat, which should be more or less at rest during the use of the voice, are absolutely put into continuous constrained action in improper methods of speaking, as is evinced by uncomfortable sensations during protracted or impassioned speaking, or shortly after it. In the same manner as physical consciousness of the possession of a stomach, or of a tooth, or of a toe, for example, is evidence that something is wrong for the time with the stomach, the tooth, or the toe, so physical consciousness of the possession of a throat during speaking, or shortly afterward, is evidence that something is wrong with the throat. The strain upon the muscles, and the sense of uneasiness following, are cause and effect; both of which may be avoided by proper use of the organs of voice and of speech. In civilized communities, conventional or affected methods of doing things of various kinds are employed by many people instead of natural methods, for various reasons, such as the desire to impress others with a sense of individual importance or originality; and these methods are copied or imitated by others. Hence erroneous and affected methods of speaking become widespread.

To appreciate this point in the subject before us, it will be advisable to consider the factors of natural voice and speech; and then the injurious effects of departures from it can be properly estimated.

The first point to consider is that of respiration. This important function must not be interfered with during speech, and should be so managed as to be performed naturally or without conscious effort. It is painful to see the labored phases of inspiration, or taking breath, which are exhibited by many female vocalists, whose manner of dress makes it more conspicuous; and still more painful to witness it in a preacher, whose dress and surplice, even, do not hide it from the observation of his auditors.

Fig. XVI. — Abdominal, Diaphragmatic, or Natural Type of Respiration. (The figure has been reduced from a photograph.) The dotted transverse lines represent the positions of the diaphragm; the heavier one, its position after expiration; the lighter one, in inspiration.

It is well known that the thorax or chest expands somewhat in inspiration, or taking breath in, and contracts again in expiration, or giving breath out. Now a little observation will show that in ordinary tranquil inspiration the soft parts below the chest become bulged forward, in consequence of the descent of the *diaphragm*, a soft partition between the chest and the abdomen. In addition to this, the ribs at the lower portion of the chest expand slightly,

but the upper ribs remain practically undisturbed. This is what is termed *the abdominal* or *diaphragmatic type of respiration* (Fig. XVI.), because the abdomen and the diaphragm are the principal factors of the process. As the abdomen expands, the diaphragm becomes depressed, increasing the capacity of the chest vertically, and the air passes readily into the expanded lungs. In females, the ribs participate more freely in the expansion of the chest than in men, the upper ribs particularly. If a deep inspiration is favored by a voluntary continuance of the action of the abdomen and diaphragm, it is found that the action of the ribs becomes augmented, and that the entire series of ribs enters into the movement progressively from below upwards, still further increasing the capacity of the chest, and thus drawing a larger amount of air into it. This is what is termed *the lateral, costal, or rib type of respiration.* If a still further effort be made to draw air into the chest, or fill the lungs to their utmost capacity, the collar-bones rise after the ribs have all become expanded, and the upper portion of the breastbone

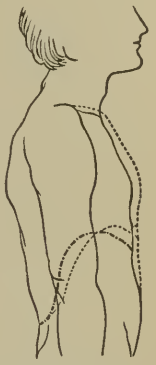


Fig. XVII.—Clavicular Type of Respiration, succeeding Abdominal and Costal Types in Succession. A forced and unnatural type.

rises. (Fig. XVII.) This is the clavicular or collar-bone type of respiration. Indeed, if the effort is pushed to its uttermost, then the bones of the spinal column, and, as a matter of course, the skull on top of it, rise also, so as to increase the capacity of the chest to its extreme limit, while at the same time the abdominal wall sinks inward towards the spinal column. If the inspiration begins with the elevation of the clavicle, and the distention of the upper ribs, the retraction of the abdomen is quite marked. The contrast between the outlines of deep abdominal respiration and deep clavicular respiration, in the male subject, is well shown in Fig. XVIII. The forced abdominal inspiration can be maintained for the requisite number of seconds, with comparatively little effort, and utilizes the entire volume of air in the lungs, upon vocal organs in a natural position; while the forced clavicular type requires considerable effort for its maintenance, and utilizes only the upper portion of the volume of air upon vocal organs in a con-

Fig. XVIII.—Diagram of deep Abdominal and of deep Clavicular Respiration contrasted.

(The heavy dotted outline exhibits the abdominal type, and the light dotted outline the clavicular type.)

strained position. The best efforts of elocution and singing are produced from a full chest of air inspired according to the natural or abdominal type.

Now, the trouble with many public speakers and singers is that, under a mistaken conviction that it is important to fill the lungs as much as possible at the commencement of a sentence or phrase, they habitually adopt the clavicular type of respiration instead of the abdominal type, which is the natural one for ordinary use, to be supplemented by the costal and clavicular types only under rare occasions for momentary use in the production of certain effects, or under the influence of certain emotions. The consequence of this vicious mode of respiration is that, by a powerful muscular effort of the auxiliary muscles of respiration, the thorax becomes fixed in a constrained position, and likewise the organ of the voice itself; and the muscles of the throat, which should be in a relaxed condition, become more or less fixed also; so that additional muscular effort is requisite to produce the necessary vocal sounds. This is not only fatiguing to the individual, but it produces a constrained voice, disagreeable to the ear of a cultivated hearer; while the effort necessary to keep speaking, diverts the powers of the speaker from gliding into many natural embellishments germane to the occasion or to the subject.

Another effect of taking too deep and strained an

inspiration, is that some of the breath is often given out again before the voice is produced, and thus absolutely rendered ineffective. The voice is produced only during an expiration, and every particle of expired air should be utilized, in order to accomplish the best effect with least effort. But if a strained inspiration has been made, there is either a painful stop before speaking, or else some of the air is allowed to escape, to relieve the uncomfortable sensation in the chest, before the vocal muscles can be brought into proper position. In this manner, the whole of the air painfully inspired is not used after all. The escape of air without utilization in voice renders frequent inspirations necessary, and thus the pernicious process is repeated.

In addition to this, the constrained position of the vocal organs prevents due play of the muscles of the vocal bands, alters their physical relation to the impact of the escaping currents of expired air, and thus enfeebles the natural tone of the voice, and renders it less sonorous and less susceptible of modulations. In consequence of this, the sounds are proportionately weak, shrill, and monotonous. In taking breath, then, during exercise of the voice, the habit should be cultivated of breathing by the abdominal method instead of elevating the upper ribs, collar-bone, and breast-bone. This supplemental method will follow the other naturally, and without visible effort, when re-

quired in the emotion of a special and appropriate occasion.

In public speaking and in singing it is requisite that a supply of breath be taken in, rather quickly, at certain intervals, determined either by the character of the passage, or the nature of the effect to be executed; and that this supply be husbanded by controlling the expiration in such a manner that the breath shall be allowed to escape from the chest as slowly as is compatible with efficient utterance. Inspirations, therefore, have to be taken at irregular intervals, varying with the sense of the passage, phrase, or sentence; and consequently no special rules can be given, applicable to all occasions. All attempts to formulate such rules have been failures. It is proper, however, to take an inspiration quietly, at every convenient pause in utterance, and to utilize every portion of the expiration following, in the production of sound. The voice should begin at the very instant of expiration,—at the very moment of impact of the air against the vocal bands; but the expiration should not be prolonged unnecessarily, for that will deprive the sounds of due volume and fulness towards the close of the expiratory effort. Care should be exercised not to take breath too often. This produces a disagreeable effect. Practice is the only criterion in this respect, and, to be most effective, the practice

should be at first under the supervision of a competent critic or instructor.

In order that respiration be properly performed during vocal exercise, it is essential that there should be no constriction at the waist. The waistcoat of the male and the corsage of the female should be sufficiently loose to permit of free abdominal respiration. Close fitting or tight corsets, therefore, interfere mechanically with efficient respiration, and impair the vocal powers correspondingly.

An easy position of the body should be assumed during public use of the voice or during vocal practice. The erect position is the best, with the book, manuscript, or score at an easy reading distance, at about the level of the neck or chin, so that the head need not be depressed, and thus interfere with easy utterance and intonation. The body must not be turned too much to the right or left of the middle line, as that prevents distinct hearing by the audience at the opposite side of the room. There is hardly any public hall which permits equal facility of hearing in every part of it. It is proper, therefore, to address the central portion of the audience; by which plan those at the two sides are placed under equal advantages. Addresses first to one side of the room and then to the other deprive those at each side, successively, of the remarks which are being made to the people at the opposite side of the house.

CHAPTER VII.

VOCAL GYMNASTICS.

THE value of systematic gymnastic exercises, in developing the capacity of the muscles in general, is universally conceded. There are a number of exercises of this kind which develop the flexibility and control of the muscles which are employed in the production and use of the voice. These are the muscles of the diaphragm, of the chest, of the larynx, of the pharynx, palate, tongue, mouth, and jaw. The gain to the individual in prosecuting appropriate exercises of these muscles is being appreciated by instructors in elocution and in singing; and certain forms of exercises have been adopted with success by some professional cultivators of the voice. The methods employed vary with different teachers.

The muscles of the diaphragm may be exercised by forcible distention or expansion of the abdomen, followed by a quick recession of its walls, as if shrinking from a threatened blow. These movements are repeated a number of times, with varying degrees of force, extent, and rapidity, until they begin to become uncom-

fortable, when they should cease for the time. They may accompany the phases of the respiratory act, the walls of the abdomen advancing during inspiration and retreating during expiration, and may be performed partly with the mouth closed and partly with the mouth moderately or widely opened.

The muscles of the chest may be exercised in a variety of modes. Jumping the rope back-door, as it is called, is a very good method of developing the large muscles of the upper portion of the front of the chest. Men often prefer the use of dumb bells or Indian clubs. Movements of the arms forward and backward, as if pushing something forward and then pulling it backward, likewise develop these and other muscles. Movements of the trunk of the body forward, backward, and to either side, the motion taking place at the hips, develop the lower muscles of the chest and those of the abdomen. Walking, swimming, and rowing likewise develop the muscles of the chest. Deep inspirations through the nostrils, or through a tube of some kind held in the mouth, develop certain intrinsic muscles of the chest which extend from each set of ribs to the adjoining ones.

The muscles of the larynx are best exercised by systematic singing exercises on the tones at and near the middle of the ordinary compass of the individual. Repetitions of the first portion of the act of swallowing, the mouth being closed, exercise the muscles of

the pharynx, palate, base of the tongue, and some of the muscles of the larynx, which can be felt to ascend and descend during the movements. Forcible expiratory efforts with the lips firmly closed, so as to prevent any escape of air, strengthen the muscles of the pharynx and upper part of the front of the neck.

The muscles of the tongue are exercised by protruding and withdrawing it, by turning the tip up to the roof of the mouth and down to the floor of the mouth, and by turning it to either side of the mouth.

The muscles of the mouth are exercised by systematic movements of the lips.

The muscles of the lower jaw are exercised by moving it forward and backward.

Flexibility of the voice is best practised, according to Mrs. Seiler, by simple exercises on the syllable *koo*, at intervals of tones and semitones, and with gradually increasing quickness.

A good deal has been written about the position which should be given to the escaping current of air during vocalization, so as to vary the effect according as the column strikes different portions of the mouth, throat, and nasal passages. Views vary a great deal with different instructors, and I know of no general rules applicable to all individuals. Exercises are best instituted under the guidance of the singing or elocution teacher, to correct defects of utterance as presented by individual pupils. The chief fault is that

the waves of sound are directed too much towards the back part of the throat, instead of towards the front of the mouth. The peculiar attractive tones of the Italians are due to their custom of directing the waves of sound towards the lips. The guttural character of the tones of most English-speaking people is due to their habit of directing the sound-waves too much towards the back part of the throat. When the sound-waves issue from the mouth, as it were, their shape or form is more regular than when they issue more from the throat; and, as we have seen (p. 101), the timbre or quality of sound is due to the shape or form of the sound-wave.

CHAPTER VIII.

DEFECTS OF VOICE.

A GREAT defect in vocal utterance, the organs being healthy, is due to pitching the voice in too high a key, that is to say, in too high a portion of the vocal register. Prolonged efforts at public speaking in too high a key are fatiguing, painful, and injurious to the voice. The fault may be corrected by paying particular attention to one's utterance for a time, even in ordinary conversation, until the proper method gradually becomes habitual, so as not to require attention any longer. The so-called chest portion of the register is the proper one to use, especially for men; but care must be taken not to use the very lowest portion of the register, as that would develop a defect in the opposite direction. When we speak in such tones that the chest is felt to vibrate under the impact of the sound-waves, we are using the voice in the most efficient and agreeable manner; and if we endeavor to imitate the tones of the voice of a friend whose utterance is particularly agreeable to the ear, it will be evident, by our sensations, that the

vibrations of the sound-waves are being transmitted to the walls of the chest. A person in fairly good health can speak for hours, when necessary, in this portion of the register, without becoming over-fatigued. If unaccustomed to using the abdominal type of respiration, it is essential that the habit of doing so be acquired. The most effective and pleasant character of voice is produced with the use of the abdominal type of respiration and the chest portion of the register.

Speaking too loud is another common fault of public speakers. It is often practised to overcome the defect produced by speaking in too high a key. The reach of the voice being less in the higher key, forcible efforts are made to throw the sound of the voice forward, as it were, so as to reach the auditors at the greatest distance from the speaker. The effect is disagreeable to the listener; and the effort is injurious to the voice, and exhausting to the speaker. If the respiration and the key-note are well managed, the voice will reach the furthest limits of the largest hall without any violent effort. A natural tone, such as is employed in thanking a friend for an ordinary courtesy, is the best one even for speaking from the platform or reading-desk. Indeed, it is related of one famous actor, that when going on the stage he would ask some bystander the time of day, and, on learning it, would reply "Thank you" in an ordinary

tone, which he preserved as his key-note in commencing his speech. It is only on certain occasions, when it is necessary to overpower other noises, as when many are speaking at once, that a public speaker is compelled to raise his voice to command attention. Otherwise, a voice but little louder than the tone employed in general conversation will suffice to fill a large lecture-room or other auditorium.

Speaking too rapidly is another defect in the use of the voice, which mars its efficacy. Very few public speakers are deliberate enough in their utterances. Rapid speech interferes with the elementary principles of acoustics. In the first place, sound-waves require a certain length of time to travel from one end of a room to the other. Then they undergo reflection from the walls of the room and converge towards the centre of the apartment, where they become irregularly commingled with the direct waves, and thus create a confusion of sounds which does not subside on the instant that utterance ceases, but continues an appreciable period afterward. Due allowance must in all instances be made for the resonance of the apartment, and time be given for its subsidence. If a series of sound-waves are generated from the mouth of a public speaker in too rapid a succession, each successive wave or impulse is liable to strike against the rebound of those which have immediately preceded it, and thus to impair their precision

of oscillation, mechanically dampening the sound. Thus, only a more or less confused succession of vocal sounds are appreciable by the audience; a jumble from which, it is true, the impressions emanating from the speaker may be gathered, but only at the expense of a certain amount of disagreeable effort of attention. Each tone is not heard forcibly and distinctly. The minds of the auditors are diverted from imbibing the subject-matter of the discourse by very reason of the mental strain necessary to follow the jumbled and mumbled utterances of the speaker; and therefore the discourse itself fails to make that favorable impression it might be entitled to produce, if those who listened to it had an opportunity to concentrate their attention upon the theme. Slowness of utterance, free from drawl, and with well-balanced pauses, sufficiently long to await subsidence of the confused mingling of direct and reflected sound-waves, is essential to excellence in public use of the voice.

As well put by an astute critic,* "The great difficulty in elocution is to be slow, and not to seem slow; to speak the phrases with such distinctness, and such management of the breath, that each shall tell, yet due proportion be maintained. . . . The art is so to manage the time that it shall not appear slow to the

---

*George Henry Lewes.

hearer. . . . No sooner have they (actors) to express excitement or emotion of any kind, than they seem to lose all mastery over the rhythm and cadence of their speech. Let them study great speakers, and they will find that in passages which seem rapid, there is a measured rhythm; and that even in the whirlwind of passion there is as strict a regard to *tempo* as in passionate music. Resistent flexibility is the perfection of elocution."

Speaking through too contracted an opening in the mouth interferes mechanically with due play of the waves of sound, and renders utterance indistinct at any distance.

A bad habit with many speakers, consists in giving too much time to the consonants of speech, and too little to the vowels. The consonant sounds are, virtually, noises produced by certain motions of the constituent parts of the mouth, as the lips, teeth, tongue, and palate, which break the voice up into articulate speech. The chief vocal sounds are those of the vowels. The vowels may be compared to the sounds from the strings of the violin, the consonants to the noises produced by the movements of the bow. If the noises of the consonant sounds are too pronounced, and the music of the vowel sounds slurred, enunciation becomes proportionately indistinct. The consonants should just be touched, as it were, and the volume of sound be permitted to dwell upon the

vowels. Indeed, at great distances, it is from the succession of vowel sounds that the sense of a word or phrase is gathered, the consonant sounds being too weak to be carried as far.* Care is requisite, therefore, to give due time to each vowel sound, avoiding prolongation of the sound into a drawling or sing-song style, which is disagreeable and ludicrous.

Another defect of voice is produced chiefly by an affected class of clergymen, who are anxious to impress their hearers with an excessive amount of solemnity of utterance in certain forms of admonition. The effect is somewhat similar to that which may be produced by speaking through the slightly closed fist held in front of the mouth. It is a reverberation of the voice produced by drawing the epiglottis down from its erect position, so that it stands obliquely over the top of the larynx, and thus catches the waves of sound and deflects them to the back portion of the throat. It is sometimes heard upon the stage in untrained actors who take the parts of the villains in certain melo-dramas and tragedies; and is not infrequent upon the platform. Excessive use of this method of utterance sometimes alters the position

* Among the slaves of the cotton-fields, it used to be common for parents to give their children such names as Tom, Bob, Pete, and the like, *so that they could hear their mammies call them at a great distance;* a utilization of vowel sounds by the untutored negro, from which cultured whites may well learn a lesson.

of the epiglottis permanently, and renders the defect very difficult to remedy.

A peculiar defect of voice sometimes encountered in men is a shrill, infantile, falsetto tone, or one somewhat like the treble of childhood, as if the usual change of voice had not taken place at puberty. As this is the sort of voice described as common to eunuchs, in whom the change is artificially prevented, the term eunichoid voice has been employed to designate it.

It is almost always a mere matter of habit. The individual is usually able, by an effort, to use his voice in the lower key, but he is impressed with the idea that this voice is unnatural. It sounds to himself so much deeper, by contrast, than what his voice really should be, that a great deal of persuasion is required to induce him to abandon the use of his false key, and adopt the natural one. The fault is best overcome by careful practice, in the lower key, under the supervision of a teacher of elocution, with immediate abandonment of the usual tone of voice, even if it be necessary for the time to resort to a whisper for ordinary purposes of conversation. Strangers will not notice anything amiss with the newly-acquired key of the voice, though it may appear unnatural for a considerable time to the individual and his immediate associates.

CHAPTER IX

CARE OF THE VOICE.

A PROPER method of producing vocal sound having been secured, it is important that proper care be taken of the voice.

It should not be fatigued by too long exercise at any one time, and the limits of salutary exercise vary in individual cases, just as with muscular exercise in general. As soon as the parts begin to feel dry and uncomfortable, and a sense of effort is felt necessary to produce the results which up to that time followed without consciousness of special effort, that moment, or as soon after it as at all practicable, the use of the voice should be suspended. The vocal effort should not be made during fatigue or hunger. Rest is requisite in the one instance, and a slight repast in the other. The voice should not be exercised, either, after a hearty meal, for a full stomach interferes with the free play of the diaphragm, and consequently with normal abdominal respiration. In addition to this, as the pharynx is part and parcel of the alimentary apparatus, it participates in the increased circula-

tion through that apparatus during active digestion, and is thus impaired for the time as a perfect resonator or reinforcer of the voice.

If the throat becomes dry during the use of the voice, it may be moistened at convenient intervals by taking a sip of water, which should be held in the mouth a moment or two before it is swallowed. Deep draughts of water flood the stomach too much, and afford no greater relief to the parching throat. With proper voice production, the sip of water is never necessary. The habit of resorting to it should be broken up as speedily as practicable. Ice may be held in the mouth during the intervals of repose between performances, if more agreeable than water, as it often is. The use of lozenges is rarely of advantage for these purposes, and those lozenges composed of pure gum or gelatine are the most efficacious. A good article of jujube paste, plain or acidulated, may be used. Medicated lozenges are apt to be detrimental, unless properly selected for some special influence that may be desirable at the time.

The voice should not be used for public purposes during ever so mild an attack of sore throat, or any indisposition that makes its use require unusual effort.

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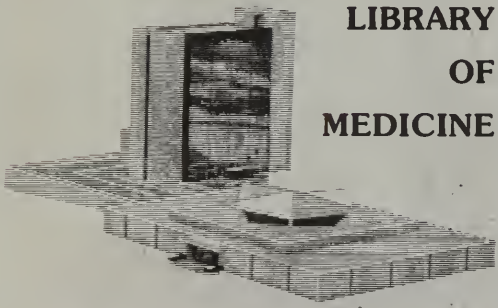

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